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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

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DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS. STREET CONSTRUCTION,
CLEANING AND LIGHTING,
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VOLUME XIX. AUGUST, NINETEEN HUNDRED. NUMBER 2.

MODEL FORMS OF ACCOUNTING FOR ELECTRIC LIGHTING COMPANIES.

By John Lyle Clough.

The most important facts with which the managing officer of any business institution, whether manufacturing or mercantile, must be at all times familiar, are those relating to the financial problems of the concern of which he is the head. He rightfully feels that he must have at his command not only the general results of his business as shown by the balance sheet, but he must also have access to all of the minutest details as well.

It is not sufficient to know that the plant shows a nominal profit from month to month, even if the bank balance corroborates this showing. He wants to know where the profits come from. He wants to know whether they are real or imaginary; whether the plant is increasing in effectiveness and value or deteriorating; whether the receipts are as large as they might be, and whether the expenses have been reduced to the lowest possible limits. A set of accounting forms that will give him the facts at first hands he must and will have. Completeness and simplicity are primary requisites in such a set. These two characteristics may be and frequently are combined without the sacrifice of either. The perfecting of such a happy combination is not always an easy matter, and many attempts to attain it have been lamentable failures. Still, it is well worth the effort and study, and generally pays handsomely when secured. The task is a comparatively simple one in a mercantile establishment dealing exclusively in wares bought at a stipulated price to be sold again at a profit. When the product is a manufactured one it becomes more difficult, although the principles apply here as in the other instance. It is not infrequently the case that a manufacturer finds himself very much puzzled to understand why the handsome profits that his sales book shows are not available when the dividend period arrives. Even if he correctly understands where the discrepancy occurs, he is almost sure to be confronted on all sides by ruinous competition born of just such a lack of perspicacity on the part of business rivals in the same field. If he honestly wants to know where his business stands—as it may be generally admitted he does—a little thoughtful attention to the subject can not fail to place him in the proper relation to it. Owners of public franchises, such as heating, lighting, or water plants, have the strongest incentive to ac-

quire the most comprehensive view of the financial status of the institutions under their charge, because as a general rule the public looks upon all such enterprises with more or less mistrust, and is invariably disposed to overestimate the profits rather than the reverse.

The system of accounting used by the Edison Light Company of Grand Rapids, Mich., seems to be not only complete, but simple as well. The forms which were submitted to MUNICIPAL ENGINEERING by the representative of that company in response to the prize competition instituted by the magazine are few in number, but they are direct and to the point. There is a harmonious unity of purpose throughout, which gives them an individuality and clearness that is altogether admirable. They are as much to be commended for the many things that they might be and are not, as for what they really are.

The Consumer's Record is a large book in which is utilized the short leaf principle, thereby obviating the transfer of names more frequently than is necessary or desirable. In this book the names are carried for one year without rewriting, but by the introduction of a larger proportion of short leaves the period might be extended as much longer as desired. The book is ruled in columns giving first at the left, the number, name, and location of the consumer, followed by a description of the nature of the service rendered. The remaining space is ruled into twelve monthly columns, each one divided by subheads into "bills rendered," "rebate," "date paid," and "amount paid." The margin of the second leaf is cut off so that when it is turned forward the remaining columns for the year are exposed, while the name and address of the customer as well are visible. The record of 48 customers for one year is thus kept upon four pages.

The cash book shows receipts by name and number on account of "bills," "sundries," "deposits," and "totals," less "rebates." The card index system is used effectively in keeping many of the records, several colors of cards with projecting tabs to distinguish them, containing the history of each connection, and detailing all necessary facts regarding the name, address, date of connections, inspection, number of motors, arc and incandescent lights, meters, etc., all arranged in the most convenient form for correct and ready reference.

The books showing meter readings, notices, bills, receipts, and other blanks, are all admirably adapted to their purposes, and involve in their operation the least possible labor. The monthly balance sheet and statistical report shows the details of earnings and operating expenses in the usual form.

Taken as a whole, the blanks are fewer in number, smaller and more compact in arrangement, and freer from unnecessary and elaborate technicalities than many of those received from other points, but they do not appear on this account to be in any sense lacking in essentials.

IMPURE AND UNWHOLESOME WATER AND ITS EXPERIMENTAL IMPROVEMENT.

By Floyd Davis, E. M., Ph. D.

Among the many municipal problems of the last few years none has been of greater moment than the securing of pure and wholesome water supplies. The principal agency that has contributed to the importance of this has been the observation by the common people that disease and epidemics are produced by polluted water. This is frequently a matter of their own observation, and every year their attention is called to cases of sickness and death produced by it where intelligent effort and proper supervision might have eliminated the cause.

The dissemination of popular knowledge through the press, particularly that of a sanitary nature, has had the effect of creating in all intelligent and wide-awake citizens, of every community, a deep interest in the quality of water that is used for domestic consumption. Increased knowledge of general sanitation has stimulated a desire for purer and more wholesome water supplies, and has enabled many of these papers, through accumulated statistical evidence, to show more thoroughly each year that impure water is the cause of many ailments that can be eradicated by the introduction of one that is pure, or has been purified before being used. The sickness that comes from impure public water supplies is a curse to our cities, and oftentimes causes people seeking homes to locate in other localities where a pure and more wholesome water can be obtained. No city can expect to flourish indefi-

LAYING GRAVEL OVER SAND ON FRANKLINVILLE ROAD, GLOUCESTER COUNTY, N. J.

nitely that has an impure water supply, and those that have secured the best water, or have gone to the expense of purifying plants, take pride in their progress and the sanitary attractions that make them populous.

As people learn from experience that disease and death lurk in contaminated water, and to drink such water, or permit others to drink it, is a willful negligence on the part of water-works authorities, and oftentimes a serious loss of human life as well, they demand remedies in the way of purification plants that will overcome the evil. The serious attention that is now being given to the improvement of public water supplies shows that the most intelligent people consider the use of impure drinking water a fault rather than a necessity, for where proper vigilance has been exercised nearly all filth diseases have been banished. This should be sufficient evidence that no pains should be spared to provide for the people a water of the highest quality.

In all communities where there has been a vigorous and steady effort to supply the people with water of the highest standard of purity, the death rate from water-borne disease has sunk to a minimum. The popular sentiment against the use of contaminated water is showing its effect in the general agitation of the improvement of public water supplies; and from the investigations that are being made in various parts of the country, it is evident that some water-works companies and many municipalities are endeavoring to determine the best and most economical means of improving their water, that it may fulfill the most thorough test of purity and wholesomeness.

It is probable that these improvements would have come long ago had a better general knowledge been entertained of what constitutes impure and unwholesome water, and the nature of waters that need an improvement. Our views on these subjects to-day differ widely from those entertained a few years since, and our means of detecting impurity are far superior and more delicate than were used a decade ago. A water now is only considered pure and wholesome when it answers all the functional requirements of the body, and is incapable of producing disturbances even in the most delicate system. Only few natural waters meet these requirements, because they contain in suspension and solution substances that are antagonistic to our welfare, or become objectionable from an æsthetic standpoint.

The vegetable and animal organisms that grow so abundantly in summer and fall in some surface waters, not only give to them objectionable color and unsightly appearance from matters in suspension, but the products of decomposition of certain ones produce a disagreeable, or even sometimes a disgusting, taste and odor in the water. These organisms grow and develop upon the decaying vegetable matter that comes from excessive plant life, and upon them there is often developed sponges that produce in their decay the characteristic taste and odor of cucumbers. It has been noticed that these waters have a tendency to produce summer complaint and winter cholera, and sometimes even intermittent and malarial fevers. This tendency is no doubt due to the decaying vegetable matter which they contain, although some organisms may have the ability to produce such disturbances through mechanical means. Any water that contains decaying organic matter

and suspended vegetable and animal organisms beyond a certain limit should not be used in its natural condition.

Some waters also have an objectionable color and unsightly appearance from suspended mineral matter, and from compounds of iron that separate upon standing exposed to the air. These objectionable waters are commonly regarded as impure, and they are certainly unwholesome, because the system rebels against anything that is not approved by the senses of sight, taste and smell. Such water is sometimes used by a community until necessity compels the authorities to purify and render it wholesome. Still it is not so much the quantity of vegetable matter and the objectionable appearance of a water as it is the presence of animal tissue and its bacteria that renders a water unwholesome. The most dangerous agency of contamination is animal refuse, like sewage and the drainage from the streets of a city, and all waters that are in the least contaminated with it should be absolutely condemned for all domestic use. A water is pure and wholesome only when it is practically free from decaying vegetation and absolutely free from the immediate products of the human body.

It is not merely the presence of contamination in water that compels us to condemn a supply, but the detection of conditions that cause the water at some seasons to seem reasonably pure, while at others it is manifestly bad. The accidental fouling of a drinking water is too often overlooked and unguarded, and it is to such carelessness that the outbreak of disease is most frequently attributed. The mere fact that a water may occasionally contain only a moderate amount of organic matter and few bacteria is no evidence that it is not generally impregnated with

FRANKLINVILLE ROAD, GLOUCESTER COUNTY, N. J., AFTER GRAVELLING.

sewage. A water that is liable to frequent contamination should be classed as impure and unwholesome, for it may produce as much harm in the unguarded hour as one that is under constant condemnation.

So long as sewage is fresh, it is liable to be disease-producing, for it may retain many of the bacteria that it had in its early existence. The best informed investigators now hold that if a water supply is exposed to constant, or even occasional, sewage contamination, it is not necessary to have proof of the presence of the typhoid bacillus, or any other pathogenic germ, to justify its condemnation. The mere fact that sewage may contain typhoid dejecta is considered sufficient evidence of danger, and we are not, therefore, forced to the difficult task of searching for the typhoid bacillus itself. This germ is among the first to disappear from a water, and its presence can be detected only a few days after the admission of filth. It seems to be so modified, or destroyed, in presence of the colon bacillus, that its identity is lost, and the colon bacillus itself disappears after standing for some time in a water that is unexposed to the air, like the dead ends of a distributing water-works system that are not properly flushed.

Sewage-contaminated water is known to be disease-producing only in its early history, but becomes apparently harmless at a later day. This is because the bacillus that causes the fever is at first in the water, but is eliminated later. Even in fecal matter from fever patients, the typhoid bacillus can be detected only with difficulty, and this germ has never been discovered in such matter that is more than fifteen days old. But aside from the influence of other bacteria in diminishing the vitality of the typhoid bacillus in water, exposure to sunlight has a wonderful tendency to destroy all bacteria, and they subside more or less rapidly in all quiet waters, and are carried down with other matter held in suspension. These are fortunate provisions of nature in the self-purification of water, and serve oftentimes to render a water endurable that would be otherwise immediately disease-producing.

All fresh sewage-contaminated water has a more or less characteristic bacteriological flora, and it is to the presence of some of these micro-organisms, other than the typhoid bacillus, that we are often enabled to detect sewage bacteriologically in a water supply. Closely allied to the typhoid bacillus is a class of sewage bacteria, which has the power of fermenting glucose bouillon at the body temperature, and there is no other group of micro-organisms that produce the same results. The typical and most important, as well as the most frequently occurring member of this group, is the bacillus coli communis; and in the examination of water, this is the organism that is most frequently sought. As this organism only originates in the intestines, its presence is positive proof that the water containing it has at sometime in its recent history been contaminated with sewage.

This colon bacillus is a natural inhabitant of man and most other animals. It always exists in large numbers in the drainage of a populous city, and is carried to polluted water supplies through the agency of fecal matter, and its presence is, therefore, of the greatest significance in showing a possible dangerous pollution. When found in

springs, or certain water courses, this germ may have but little significance concerning the quality of the water, but its presence is always proof that the water has recently received at least the excrement of some animal. When the surroundings are such as to show the immediate sewage origin of this bacillus, its presence is sufficient proof of dangerous contamination, and the water should be immediately condemned, for in case of typhoid excretions gaining access to the sewage, an outbreak of the fever would likely result through the agency of the contaminated water.

FIVE-INCH BOULDER TELFORD AND THREE-INCH MACADAM SURFACE ON BROAD STREET, ESSEX COUNTY, N. J.

Dr. Abbott, in his valuable work on the "Principles of Bacteriology," speaks in the following manner of the significance of the colon bacillus in drinking water:

"In the natural intestinal tract of all human beings and many other animals, as well as associated with the specific disease-producing bacterium in the intestines of typhoid fever patients, is an organism that is frequently found in polluted drinking waters, and whose presence is proof positive of pollution by either normal or diseased intestinal contents; and though efforts may result in failure to detect the specific bacillus of typhoid fever, the finding of the other organism, the bacillus coli commune, justifies one in expressing the opinion that the water under consideration has been polluted by intestinal evacuations from other human beings or animals. Waters so located as to be liable to such pollution can never be considered as other than a constant source of danger to those using them."

SOME FACTS AND FIGURES REGARDING ELECTROLYSIS.

*By E. E. Brownell, C. E.**

Electrolysis of the underground pipes by the return current of the single trolley system is a subject that has been extensively discussed, and many impractical plans have been proposed to overcome its destructive effects. This question is seriously confronting every water-works department, since the problem of pipe protection has never yet been entirely solved.

It is a fact that unless the electric street railways take proper care of their return current, electrolysis will attack and injure water and gas pipes in any city where the rails are used for the return conductors.

Until recently it has been supposed that no pipes were in danger except those which were electrically *positive* to, or of a higher electrical pressure than, the rails of the electric railway. But recent investigations have shown that even in the *negative* area serious electrolytic corrosion has occurred at the joints of cast-iron pipes, also upon the surface of contact between the lead calking and the pipe.

It would seem that mere self-interest should cause every electric street railway company to make their return system as near perfect as possible, not only for the saving of their motive power, but also to prevent dangers from the bursting of water-pipes, or from serious gas explosions, that are caused by electrolytic action, with the many direct and indirect damages resulting therefrom.

To the municipal water-works board this problem must be solved to insure public safety and economy. To the city itself it means the ruining of valuable street paving, by making the necessary repairs. To the water company it is a matter not only of loss of property, but danger of the loss of franchise or of suits for damages on account of failure of the water supply during a fire. To the gas company it means danger from gas explosions and heavy loss from leakages. To the insurance company it means undue fire risks, largely increased by grounded circuits or by an insufficient supply of water to quench fires. To the citizen it endangers comfort and safety.

Let us briefly consider the usual construction of the railway return circuit and see if there are any reasons for the escape of the current from the rails.

Take for example the rail bonding commonly used for 90-pound girder rails. Here they generally have but one No. 0000 copper bond. If properly bonded, so that the relative conductivity of the bond was equal to that of the rail, it would require at least nine No. 0000 copper bonds, assuming perfect electrical contact between the bonds and the rails—an important feature so very little considered.

I have carefully tested the efficiency of the bonds used upon some thirty-seven different electric roads, as compared with the conductivity of the rails, and the highest found was but 15 per cent., while the remaining thirty-six varied from that down to zero. The lowest was found upon the electric street railway of Logansport, Ind.

In four different cities where what is called the "cast weld" joint has

*Condensed from paper read before New England Water-Works Association.

very recently been installed, these joints showed seven, eight, nine and eleven per cent. efficiency of the relative conductivity of the rails.

The sellers of these joints claim the very highest electrical conductivity, but their claims are not thereby sustained by my tests, as this was all new work, and of course the rusting of the surfaces will make the conductivity decrease rapidly as time continues. No wonder the current fails to return upon the rails through such miserable bonds as these. Large rails when perfectly bonded will offer an easy path for several thousand amperes, but poor rail bonding will almost make them practically useless for this purpose. A full appreciation of the value of perfect rail bonding can be readily seen by the following: A 6-inch water main offers 140 times the resistance of a perfectly bonded 90-pound girder rail, or 560 times that of a double track of the same size. A 20-inch water main has 14.5 times the resistance of a 90-pound rail, or 58 times that of the double track, and a 36-inch water main has 4.6 times the resistance of the same rail, or 18.4 times the resistance of a double track perfectly bonded.

From these figures we can definitely say that, with perfect rail bonding, which is by no means a practical impossibility, a 36-inch water main buried under a double track of 90-pound rails would never carry more than one-eighteenth (1-18) of the current. But we find in actual practice that the rails have often but one-tenth of the current, on account of the high resistance of the bonds. In the three sizes of water mains mentioned an average of 87 per cent. of their total resistance was found to be in the joints of these pipes.

HOUSE IN FORT WAYNE WRECKED BY GAS EXPLOSION.

It has been shown that cast iron has 56 times, while commercial lead has 12 times and wrought iron 6 times the resistance of commercial copper, the former being from tests made by Prof. Lucien I. Blake, of Kansas City.

The high resistance of the cast iron and the lead at the calking, together with the poor electrical contacts of the metals at the joints, are accountable for the low conductivity of the water main, for I found in the city of Evansville, Ind., joints upon a 6-inch water main to be very high, averaging .0367 ohms, or equal to 102 lengths of the 6-inch pipe, which is 1,224 feet.

It can be plainly seen that, in order to have calked pipes the same resistance as that of a perfectly bonded double track of 90-pound rails, the water pipe would have to be of such a size as would readily admit the passage of a horse and wagon.

A few words about bonds may not be out of order. The rails ordinarily used are but thirty feet long, and as it is generally well known, various forms of joint plates are used to make the track electrically continuous. The coating of iron oxide on the rails and plates has a very high electrical resistance. Since upon the single-trolley system the entire electrical current must return upon the rails or through the earth to the power-house, it is found necessary to supplement the joint plates with some other metallic conductor, from the end of one rail to the end of the next.

These conductors are called "bonds," and the early form were made of galvanized iron wire passed around the joint and riveted into holes drilled into the rails. These soon proved inadequate, and were succeeded by solid copper wires, either riveted or wedged by driving taper pins or cones. It was found that these wires were broken by the motion of the cars upon the rails. The copper was then laminated, and the bonds put under the joint plate; but lamination has in many cases merely hastened the breaking of the copper. Many of these bonds have failed entirely during a single year. Irrespective of the breaking of the bond, its conductivity may be greatly reduced by the rusting of the surface of contact between the steel and the copper.

These metals expand with heat in different ratios, and thus permit moisture to penetrate the crack and leave a film of rust, which can soon make the bond almost useless as an electrical conductor.

The question may here arise, is there a rail bond which will maintain its contact against mechanical and chemical injury, and which will give a conductivity equal to the rail? The bonds designed by Thomas A. Edison and Harold P. Brown are guaranteed to meet these requirements, and records show that with proper installation of bonds and maintenance of track the conductivity of these bonds is practically permanent.

The New York, New Haven and Hartford Railway, upon their third-rail electric road between Hartford and New Britain, Conn., have used up two different sets of flexible copper bonds in two years' service. These were of high resistance, even when new, though their theoretical conductivity should have been equal to the rail. After the second set of copper bonds had failed, the Edison-Brown bond was applied, one under each angle plate. Recent tests show that the conductivity of the joints through these bonds is practically the same as that of the rail.

Let us for a moment look at the conditions found in the city of Indianapolis, Ind. Here four 90-pound rails, which were carrying less than two hundred amperes each, as measured upon the terminals near the power-house, showed the loss or fall of potential of 145 volts in four miles of the double track. With perfect rail bonding this loss could be reduced to less than twenty volts. In another portion of the city, where the rails should be returning five hundred amperes, they were carrying but fifteen amperes. Thus the remainder of the current was at work destroying the pipes.

These are but a few examples of hundreds of such cases which I have found in all parts of the country.

In the city of Detroit, Mich., the rails with the inadequate bonding are supposed to take care of and return as a momentary maximum load 13,000 amperes; 2,000 amperes per rail should be the maximum if each rail was a continuous piece of metal.

It is extremely doubtful whether an electric street railway with as large a capacity as Detroit can ever be provided with a *satisfactory* system of return conductors, without involving the expenditure of a sum sufficient to install a complete insulated return circuit.

From the foregoing data it can be clearly seen that practically it must require more than perfect bonding to reduce the resistance of the return circuit to its lowest practical limit (this may be some return feeder or a system of "boosters") if the single-trolley system is to be maintained perfectly harmless to underground pipes.

The main object in view is to keep any system of pipes and rails as return conductors as isolated as possible.

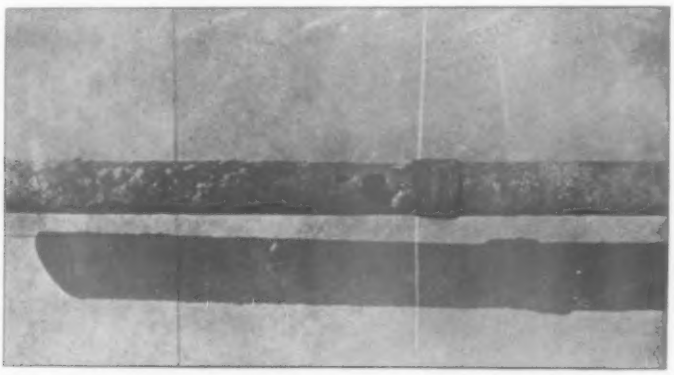
It is my opinion that under no condition whatever should the pipes and the rails be metallically bonded together; nor should the pipes form any part of the return conductors of an electric street railway, unless the leakage from the rails to the pipes is so trivial as to cause them practically no damage at the joints, which thus leaves this remedy very questionable.

HOUSE WRECKED AT SPRINGFIELD, OHIO, AS A RESULT OF ELECTROLYTIC DAMAGE TO SERVICE PIPE.

The main thing to be desired is to provide better return conductors than any piping line can offer, and not to seek the service of any line of pipe as a return conductor.

When any piping line is metallically bonded, to the *negative* side of the dynamo, the current is thus induced to return through it in inverse proportion to its resistance, as compared with that of the rails. Therefore, if the bonding is poor or the slightest accident occurs to the many thousand bonds, the larger

per cent. of the current will return upon these bonded pipes, while the conductivity of the piping line will practically remain the same for an indefinite period, but of course the rails are becoming more useless as return conductors, which in course of time, unless frequently reconstructed, will compel the pipes to carry the current, causing serious trouble from three different sources: shunted circuits around each joint (including screw joints upon wrought-iron pipes), alternating of the current from rails to water and gas pipes, and the alternating of the current from water pipes to gas pipes, from which causes serious electrolytic action has developed, even in the negative areas, that were supposed to be safe.



ELECTROLYSIS AT THE JOINT OF A FOUR-INCH WROUGHT-IRON GAS MAIN WHICH CAUSED EXPLOSION AT INDIANAPOLIS.

In the city of Indianapolis the water system is of the lowest polarity, caused by bonding them to the negative side of the dynamo, which at the same time has the highest resistance of any of the return conductors. When remote from the power-houses the water system is positive to the gas systems, and when within 3,000 to 5,000 feet from the power-house the gas systems become very positive to the water systems by reaching as high as 4.2 volts positive. This condition has caused great damage to gas and water (lead) systems over a great portion of this city, and which is not confined to those streets that are used by the electric street railway.

There is little wonder that the destruction has been great when considering that the water system was carrying 1,300 amperes and the gas systems some 1,400 amperes.

Many remedies have been proposed, which as yet have all proven a general failure, with no better prospects in the future, from the fact that the principle is wrong, since the remedy should be to keep the current from entering the pipes.

The greatest objection in allowing any piping system to act as a return conductor, even though that piping system is negative to all other return conductors, is that serious electrolytic action will occur at the joints. I have noted this electrolytic action in some sixteen different cities in the negative districts. In some places the cast-iron gas pipes were eaten entirely through at these joints, not a single piece of iron holding the pieces together. Upon many cast-iron water pipes the pittings extended nearly through

the pipe. The current in these cases was large, as I have never noticed this action where the cast-iron pipes were carrying less than ten amperes. It should be remembered that the resistance of no two calked joints is alike.

In several instances I have noted that electrolytic action had seriously affected the interior of cast-iron pipes, but this occurred only where the pipes were suspended into the air, or were surrounded by dry, sandy soil. This is probably due to the fact that the sand carbon of silicon, is so little affected as to be almost exempt." This statement is the most misleading one that I have ever encountered, for at present there is no iron known that will stand the corrosiveness of nascent oxygen.

It may be unfair to condemn the whole single trolley system until all the various methods have proven a failure—which so far they all have—but are we to remain quiet and allow the damage and destruction to continue, in order that the electric railway companies may

ADAMS HOME IN INDIANAPOLIS, WRECKED BY GAS EXPLOSION.

offered a higher resistance than the water inside of the pipe as a shunt circuit around the joint.

Any piping line which is electrically positive to the rails of an electric road is in a very dangerous electrical condition, and is sure to cause serious trouble sooner or later. Lead pipe has been destroyed under an electrical pressure of 1-100 of a volt and cast iron by one-half of a volt; yet in the face of all this some theoretical writers tell you that "cast iron, particularly those varieties known as white cast iron, which contains large amounts of

have the opportunity to experiment, with a thousand and one different trivial arrangements, ere this dangerous electrical condition is removed?

The fact of the case is this: that the electric roads have not, and it seems, will not, invest the necessary capital to secure a practical result, and this they are morally and legally bound to do for the protection of valuable subterranean systems, as I think there is nothing too good for the betterment and protection of the public water supply, of which so much is expected.

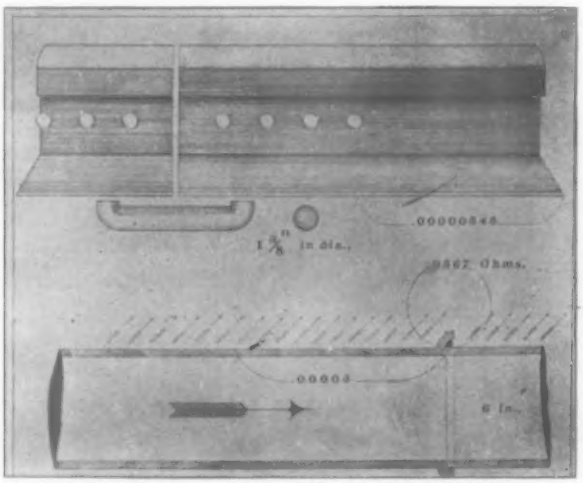
The proper time to call the electric street railway manager's attention to this important subject is before the damage is great. This can best be done by employing an electrical engineer who is in every sense capable to do this important work, and he must be frank and honest, and not allow the influence of the local electric railway to induce him to recommend things that are petty and worthless. If he proposes merely to connect the water mains by a return wire, "to pump the current out of the water pipes," set him down as the wrong man and try another; it will pay you in the long run to do so, since he belongs on the aggressive side.

The wise manager or city official will insist upon the prompt removal and correction of this dangerous electrical condition, and not wait till the pipes are destroyed.

The majority of the electric street railway stock is very often held by non-residents, who care nothing for the welfare and protection of the city, so long as they gain their franchise and operate to their own advantage.

It is safe to say that with united co-operation of all concerned in the ownership of gas and water pipes, the submission of these facts, of this entire question, to our highest court, must result in just protection so long denied.

The accompanying cut represents the relative resistance of a foot of a 90-pound girder rail and the necessary standard capacity of a copper wire for perfect rail-bonding, with perfect electrical contacts between the metals; together with the resistance per lineal foot of a 6-inch cast-iron water-main, including the average resistance of the calking of the same, the following being



the chemical analysis of the cast-iron main whose resistance is given:

Phosphorus.....	.825 per cent.
Sulphur.....	.072 per cent.
Silicon.....	2.250 per cent.
Carbon combined.	.140 per cent.
Carbon graphitic..	3.980 per cent.

The resistance of water-pipes, gas-pipes and rails increases at a very rapid ratio, as the given per cent. of carbon is increased; therefore there may be a slight variation in either, but not practically appreciable. All resistances were calculated from average of 60-foot rails and 12-foot water mains.

As the electrical contact between the copper bond and the steel rail

becomes weaker, and consequently the resistance greater, it would thus require a copper wire bond of such a size as to be impractical to make up for the loss due to the poor contacts in the bonds; therefore all electrical contacts should be maintained as perfect as possible, for the practical tests prove that the resistance is greater at the points of contact than in the copper bond proper.

Resistance tests of the pipes were also made in the ground in lengths varying from 120 feet to 900 feet, the resistance of the 6-inch water-main varying from 105 to 140 times that of a 90-pound girder rail (single) perfectly bonded with the Edison and Brown bond.

The above cut will tend to illustrate a recent test made upon a 12-inch water-main by shunting a portion of the current around the calked joint via the water inside of the pipe and the surrounding earth. The test was made at the opposite ends of two lengths of pipes, or twenty-four feet apart, with the intervening earth undisturbed between, as found in practice. The following are the average results obtained by test:

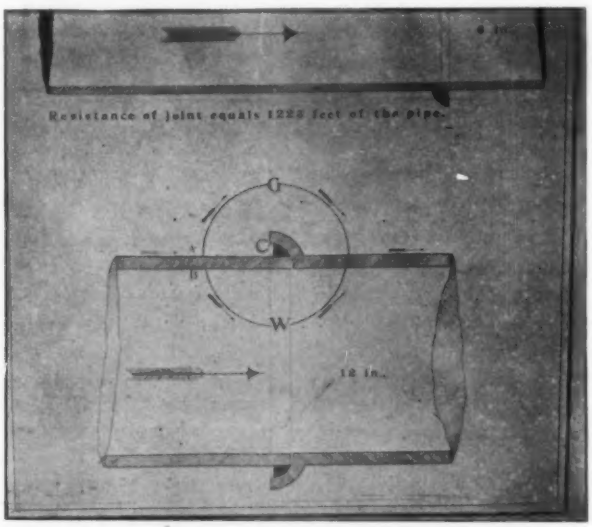
.01242 Ohms=Resistance of two lengths of 12-inch pipe, with water inside and surrounding earth.

.01552 Ohms=Resistance of two lengths of pipe, without water inside, but surrounding earth.

.02676 Ohms=Resistance after both the water and the surrounding earth were removed from pipes.

.02654 Ohms=Resistance of the calked joint only.

The resistance of the pipes were just as they lay in practical use, which does not include the resistance of the ground intervening between the rails and the pipes.

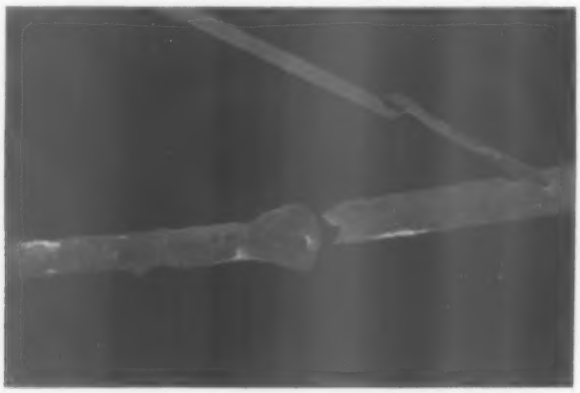


With the average conductivity of the soil, as shown by "G," serious electrolytic action will develop at "A." With no earth surrounding a water main, the trouble is very liable to manifest itself at "B."

The water shunts a very small per cent. of the total current, while the earth shunts a great deal, therefore causing serious electrolytic action upon the exterior of the pipes at the joints. For this reason no current of any capacity

should be allowed to trespass any piping line, more especially calked ones.

The calked joints of gas mains usually suffer greater from the evils of shunted circuits than water mains, due to the fact that less care is required in calking them, which thus makes them of higher resistance.

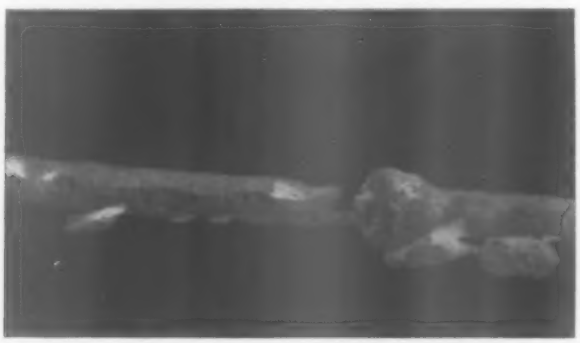


FOUR-INCH CAST-IRON GAS MAIN DESTROYED BY SHUNTED CIRCUIT AROUND JOINT IN INDIANAPOLIS.

The destruction of a 4-inch cast-iron gas main by a shunted circuit around the joint is only a fair sample of many in similar condition in the city of Indianapolis, Ind. The pipe was carrying fifty amperes one year prior to its removal, and was at that time one volt negative to the rails, but 1.2 volts positive to the water pipes, over twenty feet distant. There is no doubt but what this cast-iron main was always negative to the rails, local conditions proving this to be an unquestionable fact.

Would you expect this gas main to hold any gas? Is there any wonder that gas explosions occur?

This 4-inch cast-iron gas main when manufactured, was of the very best grade, but the shunted circuit of an electrical current of some 120 amperes has eaten it entirely apart, except but a small thread holding it together.



FOUR-INCH CAST-IRON GAS MAIN EATEN AWAY BY SHUNTED CIRCUIT.

The pipe was electrical neutral to the rails, but positive to the water main 1.2 volts, having been

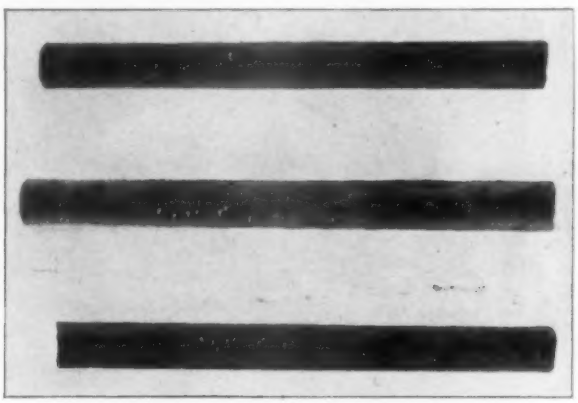
subjected to electrical currents some six years, with little possibilty of this gas main ever having been positive to the rails, as both gas and water pipes are relied upon, in the city of Indianapolis, Ind., to carry the return current, especially in the locality where this pipe was removed.

All the recent remedies have been to make the pipes electrically negative to the return conductors of the electric street railway rails. The object in view is very good so far as it goes, but the electric street railway companies think that when this is accomplished that they have met the requirements, which in reality are just begun, having accomplished but the first step, and the easiest one. The usual manner is to connect the pipes with the negative bus-bar of the dynamo, which is the greatest sham and fake used to deceive the gas and water fraternity, as the above cuts are the corpses of making such so-called remedies, and should never be allowed, as this false remedy is only misleading, by covering up the true and actual electrical condition of the pipes, which otherwise would have manifested itself.

Serious electrolytic action will develop at the joints of any pipe line, whether positive, negative or neutral, when that piping system is allowed to carry current of any capacity.

The following pipes show the average deterioration, in the positive area, upon the Dayton (Ohio) water system, after the electric street railway had been in operation 3½ years, covering several miles of water pipes, caused from an electrical pressure of from 3.5 to 7.2 volts.

The destruction from electrolysis has been more manifest in Dayton, Ohio, in the last six months than in the former ten years, including all the electrical roads, thereby proving that time will develop any favorable electrical condition, by bringing destruction and ruin to that piping system.



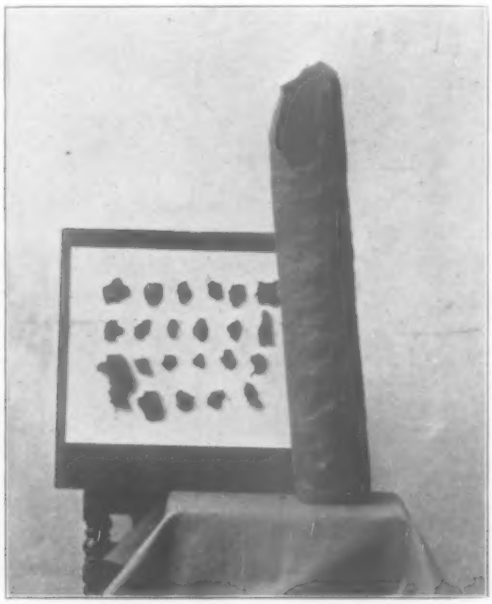
WATER PIPE AT DAYTON, OHIO, SHOWING AVERAGE DETERIORATION IN THREE AND ONE-HALF YEARS.

In all screw joints of wrought iron or steel pipe, there is more or less resistance, but trivial when compared with calked joints. The following are the results after repeated tests and after the pipes had seen not less than one year's service in the ground; also these joints were wiped with either red lead or some asphaltum preparation:

Resistance of joint of	12-in.	pipe	=	12	in. of the	pipe
"	"	10	"	"	=	14	"	"
"	"	8	"	"	=	17	"	"
"	"	6	"	"	=	20	"	"
"	"	4	"	"	=	23	"	"
"	"	2	"	"	=	28	"	"
"	"	1½	"	"	=	30	"	"
"	"	1	"	"	=	32	"	"

When new, these joints offer very little resistance, but after a short time their surfaces are separated by a film of iron oxide, which is a poor conductor.

An illustration is given showing a fair sample of the condition of over 800 feet of 6-inch water main recently abandoned in the city of Dayton, Ohio. The weight of the pipe was reduced in many places to ten pounds per foot.



A SPECIMEN OF SIX-INCH WATER MAINS AT DAYTON, OHIO.

The electric street railway system and this water main intersected 3,350 feet from the power-house, then paralleling each other to the power-house, lying six feet from the nearest rail. At the point of intersection said water main was carrying 320 amperes, at an electrical pressure of 4.8 volts, while the electrical pressure at the terminus was 7.2 volts, thus giving up 320 amperes in 3,350 feet, or 1.08 amperes per length of pipe, but practical tests showed that a greater amount of current left the pipes at the intersection than any other place on this water main.

The small particles are pieces of the decarbonized cast-iron, which fell from the pipe upon removal, being as light and brittle as common ashes.

A cast-iron water pipe, shown in illustration, became electrically positive four years prior to its ultimate removal, caused by the additional current and reconstruction of tracks, from ½ to 1.2 volts at the time of its removal.

Said pipe was delivering an average of two amperes per length of pipe, with the momentary maximum electrical pressure of 4.2 volts, which rarely occurred except on some legal holiday.

The pipe was seven feet from nearest rail, and over 3,850 feet from the power-house. This pipe is *not* an average sample of miles

of similar affected water main in the city of Dayton, Ohio. When removed, this pipe had but one perceptible hole in it, with no visible pittings, but upon careful inspection it was found to be extremely soft, and could be easily cut through with a pen-knife, with greater ease than if it had been lead. The surrounding soil was of a gravel nature, very high in the alkaline salts, sodium carbonate and sodium chloride.

A CAST-IRON WATER PIPE THAT BECAME ELECTRICALLY POSITIVE FOUR YEARS BEFORE REMOVAL.

A view is given of the results of the gas explosion that so completely ruined the Nichter home, in the city of Fort Wayne, Ind., caused by electrolytic action eating a hole in the wrought-iron service pipe, which thus allowed the gas to percolate through the ground into the cellar. Several members of the family were injured, especially the young man, whose deplorable condition rarely ever has any equal, making it one of the most heart-rending sights ever beheld by a living mortal.

In this case the gas service and water pipe occupied practically the same trench, with but a small space between them. The wrought-iron service pipe was found to be corroded near a union, which was the closest point to the water pipe. Now this gas pipe being highly positive to the water pipe, liberated its current to the water pipe, setting up serious electrolytic action upon the wrought-iron service pipe at that point. All other parts of this pipe were found to be in good condition and intact.

You should not think, because the current upon your water or gas main is negative, that you are safe from electrolysis, for facts disprove this condition is safe.

Another gas explosion occurred at Springfield, Ohio, due to electrolytic action eating off the service

pipe and thus allowing the gas to percolate through the soil into the cellar; hence the result.

Electrolysis around joint of a 4-inch wrought-iron gas main, current traveling from left to right, which deteriorated pipe caused the following great gas explosion. Resistance of joint was 2.8 times that of the lineal foot of the pipe. It is apparent that wrought iron can withstand but a very small shunt without serious electrolytic action.

This is the result of the Adams gas explosion, that occurred in the city of Indianapolis, Ind., from the effects of the electrical deterioration of the foregoing pipe, which was carrying some thirty amperes, this pipe having no connections with the cellar of the house, but the gas was allowed to percolate through the soil.

The question has been asked, How far from the rails of an electric street railway will electrolysis occur? It depends upon the positive electrical pressure of the current upon the pipes, or, more properly, the resistance of the intervening earth. I have seen serious electrolytic action upon a cast-iron water main that was over sixty feet distant from the rails, the pipe being 5.6 volts positive.

There is but one way to remedy this great evil, and that is to do it right, by all means, first as last, and thus avoid the damages resulting. Be not deceived by the claim made by a great many single-trolley electric street railways that there is no successful remedy. It is only the necessary capital that is needed to annihilate this evil and avoid great damages, loss of life and limb.

CEMENT SPECIFICATIONS FOR SIDEWALKS.

The following letter gives the interpretation of the cement specifications on page 19 of the July number of MUNICIPAL ENGINEERING made by the Pittsburg Department of Public Works, and removes the only objection made to the requirements for cement to be used for sidewalks:

To the Editor of Municipal Engineering:

SIR—I have just read the July number of MUNICIPAL ENGINEERING, and am pleased to find that you thought our specifications for cements and cement sidewalks of sufficient value to reprint in your publication.

We have made the specifications the same for Portland cement used in concrete, masonry, sewers and sidewalks, as far as the fineness and tensile strength, etc., are concerned, but this does not mean that the same brand of cement will be used for all these classes of work. Under heading, "Additional Tests," you will find a clause that requires the cement to stand such additional tests that will determine if the cement has the proper qualities for the particular class of work for which it is designated. One of these additional tests, and one of the best ones, too, is to observe how the various brands of cement are acting in work constructed, and especially in work that has been constructed some years ago. Under this clause we can reject any cement that has proven itself unfit for the particular kind of work it has been used in. Of course, the conditions under which it was used have to be taken into account also, but if there are a number of cases of failure of the same brand of cement, it should be rejected, until it can be proven, either that the brand of cement has been improved in quality, or that something else caused the failures. This in particular applies to cement for sidewalks.

Imported cements were used exclusively in this city a few years ago for sidewalk work, but the American brands are gradually replacing the imported, and have so far shown themselves to be equally good for this class of work.

I wish to call your attention to the maintenance clause in the specifications, and also to the clause in the articles of agreement specifying the length of the maintenance period.

I take pleasure in sending you, under

separate cover, a copy of the first edition of our new sewer specifications. All these specifications sent you are drawn up on lines entirely different from our old specifications, and being the first edition of the revision, they are not considered to be complete and free from mistakes and omissions, but they form a base on which complete specifications can be built up, by making such changes as experience will teach us.

I take the opportunity to mention that Mr. H. B. Rust, assistant engineer in this bureau, has helped me greatly in getting up these three specifications.

Any criticism of the specifications is appreciated, as it helps us to find the weak points.

Thanking you for your kindness, I am,

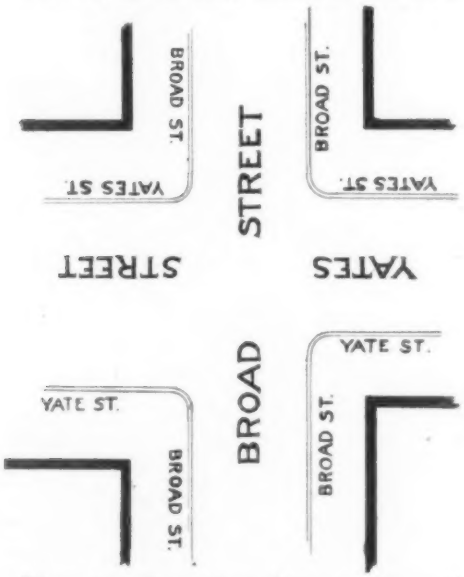
Yours very truly,

JOHN BRUNNER, *Superintendent.*

STREET SIGNS IMBEDDED IN SIDEWALKS.

To the Editor of Municipal Engineering:

SIR—I notice in your July number, page 21, which I have just received, an article headed "A New Plan for Locating Street Signs." I may say, this matter occurred to me about eighteen months ago, but was not adopted by the corporation I was then serving, and now, rather strange to say, the idea has only just come into use here, and, in fact, the first intersection was only completed a few days before your magazine arrived here. I enclose a print showing the arrangement of signs to be followed in our city, and a few particulars of our system briefly follow.



The wooden pattern letters are bedded in the concrete walks just inside the stone curb, flush with the surface, as shown in the illustration. Immediately when the concrete becomes set sufficiently, the letters are removed, and the space (which is one inch deep) filled with colored cement mortars and marble screenings. When the whole is thoroughly set, the surface is cleaned off and ready for traffic. Trusting this information will be of some interest, I am, yours truly,

C. H. TOPP,

City Engineer, Victoria, B. C.

POLLUTION OF RUNNING STREAMS BY SEWAGE.

By C. W. Tooke, A. M., LL. B.

In the May number of MUNICIPAL ENGINEERING appeared an editorial comment on the subject of the pollution of streams by sewage, which purported to be based on a decision recently rendered by the supreme court of New Jersey. The statements made in the editorial appear to the writer to be so misleading and so directly in conflict with his opinions on the same subject, published in the January and

March numbers of this magazine, that it may be well to review the recent New Jersey decisions and to point out that the supreme court of that state is in no wise in accord with the supreme court of the state of Indiana, but that its authority only sustains the uniform opinion of the courts of this country and of England. The first New Jersey case is that of the Mayor, et al., of the City of Newark *v.* Sayre, reported in volume 45 of the *Atlantic Reporter* at page 985. The complainant, Sayre, was the owner of land having a frontage of some 200 feet on the Passaic river in the city of Newark. At that point, and for several miles above the city, the tide ebbs and flows in the river, and the river is navigable for vessels of considerable size. Consequently, the state was the owner of the bed of the stream below ordinary high-water mark, but in pursuance of an implied license from the state, growing out of the local common law of New Jersey, the complainant, owning the upland, had built a dock in the front thereof, and thus had acquired title to much of the land on the shore as was occupied by the dock. The object of the bill of injunction sought was to restrain the city from completing and using a public sewer, in the process of construction and designed to empty its contents into the river about fifty-six feet above complainant's property. The ground of the objection was that the sewage discharged would be carried by the tide to the complainant's property and would so infect the water and air in the neighborhood as to impair the comfort and health of persons engaged on the premises and thus impair the value of the property.

The questions considered by the court were three in number—(1) Whether the legislature had intended to authorize the city to construct and use such a sewer; (2) whether the legislature had the constitutional power to grant such authority; (3) whether the complainants, as private owners of property likely to sustain some incidental damage from the operation of the sewer, were entitled to have the city restrained from exercising the authority conferred. The first two questions being answered in the affirmative, the court comes to the consideration of the third. The decision of the court on that point is based primarily upon the fact that the waters in question are tidal waters, and that the rights of the state and of the riparian owners in this case are to be distinguished from those of an ordinary stream. The court quotes the statement of Chief Justice Beasley, in Stevens *v.* R. R. Co. (34 N. J. Law 532), that "all *navigable waters* within the territorial limits of the state, and the soil under such waters, belong in absolute propriety to the public; that the riparian owner by common law has no peculiar rights in the public domain, as incidents of his estate; that, as a general rule, the public domain is subject altogether to the control of the legislature; that the dominion of the legislature over the *jura publica* appears to be unlimited." The court shows that from time immemorial tidal streams have been used for this purpose, whenever they could be conveniently reached, and concludes that the right of the state over such navigable waters must be considered superior to the rights of the riparian owner, who has no peculiar right either in the water itself or in the bed of the stream below high-water mark.

Justice Dupue, in his able concurring opinion, reviews the decis-

ions of the courts of other states as well as those of New Jersey, basing his entire argument on the distinction between tidal streams and ordinary non-navigable streams, in which the riparian owner may have title to the middle of the bed. So that so far from affecting the uniform opinion of the courts of this country that the riparian owner may enjoin the pollution of the stream by the discharge of sewage, this decision applies only to the case of tidal waters, in which the paramount title has always been regarded to be in the state, and the rights of abutting owners are similar to those of other members of the public in their use of the waters thereof. This New Jersey decision indicates no departure from established precedent, but rather sustains the uniform doctrine of other courts which have passed upon this question.

In the case of Gray *v.* The City of Paterson (45 Atl. R. 995), decided at the same session of the court, the question of the pollution of ordinary streams did come directly before the supreme court of New Jersey. In this case the court distinctly states that "the rights of those above the flow of tide are in no wise involved in the decision of the Sayre case." It holds that the title to the bed of the Passaic river above tide water is in the riparian owner, subject only to the right of the state to regulate navigation so far as the river is navigable. This title, says the court, would be barren, if the owner could not invoke the aid of the law to preserve it from destruction. The court calls attention to the case of The City of Valparaiso *v.* Hagen, 54 N. E. R. 1062, and states that assent can not be given to the doctrine of the supreme court of Indiana, as it is not in harmony with decisions of the courts of New Jersey.

The only damages set forth in the facts of the case that are cited in the opinion are those incidental to the pollution of the water supply of Jersey City. But the court holds that permission by the state to that city to draw water from the Passaic river might be withdrawn at any future time by the state, and that the grant of the right of discharging sewage to the city of Paterson must be looked upon as an implied repeal of the previous grant to Jersey City. As to the riparian owners above tide-water, the extent of whose damages by reason of the discharge of the sewage is not stated, the court refuses to act by granting an injunction until it may be shown that an adequate compensation may not be given them at law. While the city of Paterson may not assume from the long acquiescence of the riparian owners a right to deprive them of their property in the stream, the injury that might result to the city from the granting of the injunction seemed to the court to be so great in comparison with the trivial damages to the complainants, that the court refused to grant the injunction prayed for and recommended to the complainants the pursuit of their remedy at law by which they could obtain adequate damages. Thus it can be seen that both of these decisions are in no wise in support of the doctrine laid down in the case of The City of Valparaiso *v.* Hagan, but rather, that the facts upon which they are based essentially differ from those of the Indiana case, which seems to be supported only in the state of Massachusetts (Merrifield *v.* City of Worcester, 110 Mass. 216). The questions involved in these and similar cases will have to be worked out finally by the supreme court of the United States, and there can be lit-

tle doubt, in view of recent decisions of that court in upholding the rights of private property against the encroachments of the state and its agencies, that the highest tribunal of the land will hold that no municipality, even under legislative authority, can be permitted to take private property without due compensation.

BOOKS ON SEWERAGE.

THE SEPARATE SYSTEM OF SEWERAGE; ITS THEORY AND CONSTRUCTION. By Cady Staley, President of Case School of Applied Science, Cleveland, Ohio, and Geo. S. Pierson, M. Am. Soc. C. E. Third edition, revised and enlarged, with a chapter on sewage disposal. 324 pp., maps, illustrations and diagrams. $3.

SEWER DESIGN. By H. N. Ogden, C. E. Assn., M. Am. Soc. C. E., Assistant Professor of Civil Engineering, Cornell University. 234 pp. $2.

SEWERAGE; THE DESIGNING, CONSTRUCTION AND MAINTENANCE OF SEWERAGE SYSTEMS. By A. Prescott Folwell, M. Am. Soc. C. E. 372 pp. $3.

Since the American reprint of Latham's treatise on sewerage was exhausted there has been no book obtainable which attempted to cover the entire field to any degree until the appearance of the third book listed above. The first edition of Staley and Pierson's book appeared in 1886, but it is confessedly confined to the discussion of a single class of problems. Mr. Ogden's book was prepared simultaneously with Mr. Folwell's, and they appeared at very nearly the same time. It treats the subject of sewer design to about the same extent as the first 156 pages of the latter book, the only differences being those due to personal opinions of the relative importance of various questions. The titles describe the fields covered by the books very clearly, and with the statement that all are about equally reliable and treat the subjects covered with about equal fullness (or brevity), the engineer can readily choose which he wishes to place on his shelves if he is unable to take them all.

No one of them is an exhaustive treatise even of the portion of the subject treated, and not even the largest will compare, as a statement of the entire knowledge of the science and art of sewer design, construction and maintenance at the present day, with Latham's treatise on the subject as it had been developed up to the date of the preparation of his book. The entire subject has been developed in this country since the appearance of the American reprint of Latham, about twenty-two years ago. An American supplement could not be prepared at that time because there were only one or two men who had developed the subject under American conditions in any scientific way, and they could not be induced to put what their experience had taught them on paper. The books are good practical books for the every-day engineer, and Folwell's book in particular should be very valuable for use in engineering schools which attempt to give a "fourteen weeks' course" in the subject. A good idea of the general principles upon which good practice is based can be gained from the books, and many details of the office and field work, which will be of benefit to the young engineer, are presented in very satisfactory form.

It may be well to call attention to the points in the books which, in the writer's opinion, have received the fullest treatment.

The first chapter of Staley and Pierson's book presents the usual

arguments in favor of the construction of sewer systems, and is often valuable in impressing town councils with the evils of their sewerless condition. It has often been used in this way, and with considerable effect.

The arguments against the combined systems and in favor of the separate system are given in the second and third chapters. They are quite partisan in their character, and do not have their full weight on this account.

In chapters nine and ten this book gives full descriptions and drawings of forms of sewers and sewer appurtenances. It presents, even more fully than Mr. Ogden's book, the results of his experiments and those of others on the effectiveness of flush-tanks, and is in this new edition quite up to date—something which does not often happen in technical books.

There is a good chapter on house drainage and plumbing, a subject with which every sewer engineer should be familiar. It also discusses the questions of assessment of cost. In these two subjects the book is unique. The latter discussion, especially, is scarcely to be found elsewhere.

Mr. Ogden gives a valuable short chapter on estimating the cost of surveys and making the necessary examinations and borings, gathered from the proceedings of various engineering societies. His discussion of the methods of determining the relation of sewer discharge to rainfall and his comparison of the formulæ which have been proposed for estimating the ratio for a proposed sewer is the most complete of the three, but is far from being exhaustive. The same may be said of the discussion of increase in population and of flow in sewers.

Folwell's book has as many detail plans for sewers and appurtenances, large and small, as Staley and Pierson's has for the separate system, and it makes many practical suggestions on the numerous practical difficulties which arise in fitting a general design to the actual conditions found in the ground. The last hundred pages of this book are filled with practical details of superintendence and construction, which must have been written by one thoroughly familiar with the difficulties to be encountered. This portion of the book is not to be found elsewhere, and there is scarcely an engineer who will not pick up some valuable pointers from reading these pages. They will be of great value to the young engineer just beginning practice or the older engineer taking up this line of work. These pages will probably be run over rapidly in the college class-room, as their value will hardly be understood by the inexperienced student; but when he gets out on the sewer trench he will find their application. Some of this belongs rather to an inspector's hand-book, but is not out of place in this book as it has been designed.

Taken all together, Folwell's book is the most valuable, if but one can be purchased, unless one wishes to study the separate system carefully; but there are important discussions in both the other books which the engineer who wishes to cover the subject should not miss. After he has read them all he will agree that the complete theoretical treatise on sewerage is yet to be written.

Any of the books mentioned can be supplied by MUNICIPAL ENGINEERING CO. at the regular prices.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

STREETS AND ROADS MADE OF CRUSHED STONE.

I wish you would give, if possible, some information, derived from experience, on streets in small towns and roads made of "crushed stone," laid on loam and clay foundation. *R. H. Chapman,*
Surveyor, Ortonville, Minn.

There are many articles in MUNICIPAL ENGINEERING discussing this question in detail, and others will follow from time to time. Among those appearing recently are those on pages 330, 332, 333, May, 1900, and 377, June, 1900, discussing the work of the Massachusetts Highway Commission. The reports of this commission are most valuable upon the particular subject of this question, and can doubtless be obtained by addressing the commission at its office in Boston. Frequent extracts from them will be found in this magazine. On page 260, April, 1900, will be found extracts from the report of H. I. Budd, Commissioner of Roads of New Jersey, in which state much similar work has been done under conditions somewhat different. On page 80, August, 1899, will be found a very condensed abstract of the full discussion of macadam roads, which appeared in the Transactions of the American Society of Civil Engineers for June, 1899. Those who participated in this discussion are the recognized experts in this country upon road and street construction, and they gave the results of their practical experience. Other recent articles will be found on page 168, March, 1900, and page 244, April, 1899, the latter giving a list of valuable articles which appeared in this magazine prior to that date, and a list of books on the subject. Rockwell's "Roads and Pavements in France" ($1.25) may be added to the list. The pictures in the last number of MUNICIPAL ENGINEERING make a very good practical article on macadam roadways.

INFORMATION ABOUT ASPHALT BLOCK PAVEMENTS.

Wishing to make a special study of asphalt pavements, especially the block form, I desire to ascertain the various sources of supply of the raw asphalt, the different elements that are employed in the composition of the blocks, with their proportion, and the kind of residuum oil used to temper the raw asphalt, and shall be glad to learn prices of the various ingredients. I shall be glad to know of any scientific treatise on the production of asphalt blocks or allied asphalt work.
George Champe, Toledo, Ohio.

Trinidad asphalt has been used almost exclusively for making asphalt blocks. All the makers of asphalt blocks operate under the same patents which were developed with Trinidad asphalt. Limestone and trap rock have been successfully used, but granite was not found satisfactory. Owing to the heat required in the process, some kinds of stone are ruled out and, if overheated, limestone disintegrates. Other materials have been used, including the copper sand used by the Lake Erie Asphalt Block Company, whose works are at Toledo. The New Castle Asphalt Block Company, of New Castle, Pa., uses trap rock and limestone. The former material seems to produce a block with the greater resistance to abrasion. The process is not secret and no doubt the companies mentioned will give information as to changes in mixtures for differences in conditions and character of materials obtainable. Quotations of prices must be obtained for the particular locality. The processes being patented there is very little literature on the subject aside from the pub-

lications of the various companies making blocks.

Many articles on the various phases of the asphalt question have appeared in MUNICIPAL ENGINEERING. Some of those of recent date, having some reference to the questions asked will be found on page 282, November, 1899; pages 228 and 259, April, 1899; page 187, April, 1898; page 164, March, 1898. Reports of City Engineers of Philadelphia, Pa., Cleveland and Dayton, Ohio, and of the Public Works Departments of New York, Baltimore, Washington, and other cities where blocks have been used give varying reports of their success. The Washington reports are valuable, giving reasons for such failures as have occurred.

FACTS REGARDING THE USE OF FLUSH TANKS.

Our city is about to put in a flush-tank sewerage system, and as our franchise does not particularly refer to that question except in the wording "water for the flushing of sewers," I would kindly ask you to let me know what law there is governing such points as the quantity of water that can be used, how often the flush tanks can be operated and the size of supply pipe to flush tanks. *Columbia Water and Light Co., J. M. Sherman, Supt., Columbia, Mo.*

These questions have been discussed in several numbers of MUNICIPAL ENGINEERING. Among them are the following: July, 1896, p. 34; Aug., 1896, p. 104; Sept., 1897, p. 170; Feb., 1898, p. 91; April, 1898, pp. 208, 217; Jan., 1899, p. 24; Nov., 1899, p. 305; May, 1900, p. 310; July, 1900, p. 23. All these give theoretical and practical points of value in this particular case. It will be seen from the facts stated in the articles that the amount of water required for a flushing depends on the size and gradient of the sewer. The frequency of flushings depends upon local conditions. No determinations have been made of the probable frequency from the standpoints of both efficiency and economy and they must be made in each particular case. The usual size of supply pipe is $\frac{3}{8}$ to $\frac{5}{8}$ inch. The stop-cock can be set by trial to fill the tank once a day, more or less, as may be necessary to keep the sewers clean. There are no fixed rules upon the subject, but a careful reading of the references given and of Staley and Pierson's "Separate System of Sewerage" ($3) will give an idea of the common practice in the many cities using flush tanks.

COMMENT ON CURRENT TOPICS.

Standard Cement Tests.

To continue the abstract of answers to the questions of the committee of the American Society of Civil Engineers on the Proper Manipulation of Tests of Cement: Questions 32 to 34 are as to the determination of the time of setting. Nearly all recommend the standard needles, five being in favor of the German method, and two others finding all methods unsatisfactory. Nearly all prefer neat cement (question 35) and all answer the questions regarding temperature and consistency (36 and 37) as the similar questions (23 and 24) were answered. Most operators keep the pats under a damp cloth or in damp air. Mr. Richardson says the dampness seriously delays time of setting and change in temperature changes rate of set. Very few would keep the pats in water.

Nearly all replies consider tests for soundness (question 41) of

great value, some placing it on a par with tests of tensile strength. The standard methods are most popular, but a few recommend the hot water or boiling tests. They hasten the determination. Natural and Portland cements can not be treated alike. Thus pats of natural cement can usually be put in water as soon as made without disintegrating, while some first grade Portland cements will crumble immediately, if so treated. Natural cement may not stand the hot water test, but any normal Portland will do so and nearly all such will stand the boiling test. Pats of Portland cement should remain uniform in color and the edges should remain sharp. Mr. Gowen suggests the bottle test, filling a bottle with a small neck with a cement grout, the sample to be watched for checks and cracks, as well as for cracking of the bottle by expansion. Only a few recommend the boiling test and they seem to prefer that it be left to the well equipped special laboratory, indicating that failure under the conditions of the ordinary city laboratory should not be taken as certain condemnation of the cement.

With reference to compressive strength (questions 62 to 67), nearly all advise them, one or two depending upon them to the exclusion of those of tensile and transverse strength. The opinion seems to be general that the tests can not be made in a temporary laboratory, but must be made in the permanent commercial or college laboratories having the necessary machines and experience. Too few have used the method to have any fixed idea as to form and dimensions of test pieces (63). All would treat the mortar the same as for tension tests (64). There are several methods of getting a true bearing in the press, truing with trowel, setting against glass and the use of sheets of lead, thick paper card-board, plaster of paris, or fine sand (65). All the prominent machines are mentioned (66) and the rate of applying the stress varies up to 1,000 pounds a minute (67).

The same questions regarding bending tests are asked. (Questions 68 to 72.) Seven advise them and six do not. Two would restrict them to concrete and two would only use them in the research laboratory. The answers regarding form of test piece, machine to be used, etc., are too scattering to indicate any settled opinion. The same is true of the answers to general questions asking for recommendations regarding tests of adhesion, abrasion, resistance to freezing and resistance to action of sea-water.

A number of persons make general and particular suggestions in regard to the work of the committee. Mr. M. L. Holman gives expression to the opinion of many implied in their answers when he suggests that the committee divide the subject into two parts—the testing of cements of known reliability and the testing of new cements. Others might express this as testing in temporary or quasi-tempo-

rary laboratories and testing in permanent laboratories, well equipped with machinery and experts.

The general intention of the persons answering the questions seems to be to discuss the first class of tests, a few of the experts adding also the fine laboratory tests.

It is the series of methods for the so-called temporary laboratory which is needed. The chemists who are investigating new cements will develop their own methods, and use them, with little reference to what may be prescribed, and much of the work of the committee on Mr. Holman's second class would therefore be of little moment.

The tests for tensile strength will be considered later.

Sewer Specifications. The department of public works of Pittsburg has recently issued a revision of the specifications for sewer work in the city which makes them very complete and an excellent basis for good work. The specifications as a whole are a good description of the proper method of constructing a sewer. A few points of interest may be noted. The cement used on the work must be Portland cement which will fill the specification given on page 19 of our July number. This should certainly produce good mortar, especially since the proportions are one of cement to three of sand. As the Portland cement specified will cost not less than four times the specified natural cement, and the proportions of natural cement mortar are 1 : 2, the mortar for sewers will cost nearly three times as much as it would were natural cement used. Is the extra cost warranted by the increase in quality of work? With "political" inspection it is probable that the work will be good enough to stand if Portland cement of the quality specified is used, while it is quite possible that work constructed with natural cement would be seriously defective. Improvement in work is secured in such case by increasing its cost. Would Portland cement mortar made 1 : 4 or 1 : 5 be strong enough? That is, would it get into the work as strong as natural cement mortar made 1 : 2 under good inspection? Unless the conditions in the sewer trenches are very unfavorable it would seem to be economy to improve the inspection of work and cement rather than spend too much trying to improve the work by using a higher grade of materials than should be necessary. It may be that Pittsburg does not have this trouble about inspection and that bad soil demands the better work that should be secured with the rather high grade of cement specified.

Shale brick are used in brick masonry unless otherwise specified. In sewers, the outer rings and part of the inner ring are laid with common brick, while the lower half of the inner ring of sewers less than three feet in diameter, and the lower third of others, are laid in "good, vitrified, side-cut, shale brick of standard size and shape

and uniform quality, composed of rock thoroughly ground." They are not "seconds," of the ordinary sizes of paving brick, but, it would seem, must be made expressly for sewer work. This makes another addition to the cost of Pittsburg sewers, which must be considered when making comparisons with the cost of such work in other cities. This increase in cost is easily justified. The value of the harder, smoother surface for the invert of the sewer is fully equal to the increase in cost, and this kind of material is well-nigh indispensible in the sewers of steep grade and large capacity, of which Pittsburg has a full supply. It is frequently necessary to replace the inverts of sewers built with common brick under such conditions of excessive wear. The harder surface secured through these specifications will save these expensive repairs, or at least indefinitely postpone them. The increase in first cost is, therefore, really an economy. An additional precaution is taken by covering the entire invert with a layer of Portland cement mortar, not less than one-fourth inch thick. So long as this coating lasts, the vitrified brick do not have an opportunity to show their value. The added smoothness is of some value in sewers with low gradients, when the sewer system is new, in reducing the resistance to the flow of the small quantities of sewage then flowing. It is not worth what it costs on other sewers when vitrified brick are used in the invert.

In laying pipe sewers the gradient is kept by using a level three feet long set on blocks which make the allowance for the change in level in this distance, one block set on the last pipe laid and the other on the one being laid, the level thus spanning the bell to be cemented. The method of checking the pipe level at intervals is not given. For sewers with a good fall this method is not objectionable, but for sewers nearly level it is not sufficiently accurate, unless frequent marks are set in the trench to correct deviations; neither is it possible for the inspector to keep as good control of the line and gradient as he should. Measurement down from a line stretched above the grade line and parallel to it can be made by the inspector himself, and can be made to any desired degree of accuracy, using a pole with a projection at the bottom to set in the flow line of the pipe.

Excepting with regard to refilling, the specifications show the same attention to practical detail which has been commended in other specifications from this office.

A report upon the success attained in refilling trenches under the following specification in all kinds material would be of interest. Do pavements settle over trenches filled in the best manner attainable under it?

"The trench from a point two feet above the top of the sewer to the surface of the adjoining ground (cut-grade under pavements) shall

be filled with the excavated material, the filling to be made in layers not more than twelve inches in thickness, and each layer thoroughly consolidated by ramming, before the succeeding layer is put in place. The filling shall be crowned above the trench whenever so ordered by the director. Water shall be used in consolidating fills whenever the director may designate, and in such quantities as he may order."

Milwaukee Meeting of A. S. M. I.

The American Society of Municipal Improvements will hold its next meeting at Milwaukee, August 28–31. The President, Mr. A. D. Thompson, of Peoria, promises a programme that will be interesting and instructive. The members of the society should all attend and bring as many new members to the meeting as possible. The past conventions of this society have been most valuable to municipal officials from the fact that the vital and pressing technical questions of municipal public work have been discussed by the foremost experts in the country from the standpoint of the practical municipal official, and the results of its deliberations have been directly applicable to work on the street and in the office. The engineer, the mayor, the councilmen, especially the committee or board having the public works in charge, will all find much of interest and of direct personal value in the discussions. This is true of the smaller cities even more than of the larger ones. It is always true that a large number of the members offer nothing to the discussions, but these men are, many of them, just those who express the most satisfaction with the results of the meetings. There is always a place for the report of the results of new experiments and combinations. The meeting of the G. A. R. at Chicago insures the lowest of railroad rates for the meeting, and Milwaukee is one of the pleasant cities for a summer convention.

Uniform Municipal Accounts and Reports.

One of the important questions to be discussed at the Milwaukee meeting of the American Society of Municipal Improvements, August 28–31, is that of uniformity in municipal accounts and in municipal reports, with the allied question of the collection of municipal data by bureaus of the U. S. government.

A report will be presented by the Committee on Municipal Data. This committee has been considering one branch of the subject—that of uniform annual reports, and has presented some forms which have been ready for discussion for two years. In connection with these forms it recommended the selection by the proper official in the census bureau of such portions of them as are suitable to the investigations it is proposed to make. The adoption of these forms by the society, and in part by the census bureau, would be quite a step in advance.

It is hardly possible to secure uniformity in annual reports without some approach to uniformity in methods of keeping accounts. Mr. M. N. Baker will present a

paper upon this subject and will also consider the collection of municipal statistics by the general government, so that all phases of the subject will receive some attention.

The entire subject of uniform accounting is too large for any one society. A statement of the efforts at uniformity in various lines of municipal and corporate bookkeeping by Mr. Baker shows that the field includes nearly all lines of collective human activity. The portion which the A. S. M. I. has within its province is a very small percentage of the whole. It is, however, a very important part and one which will have several census employes working upon it when the special census investigations are taken up. The many expressions of disgust at the present impossibility of making even the most elementary comparisons of the work of different cities in any one department would suggest some interest in a proposition that would tend toward uniformity, but there are only sporadic instances of interest. There are hardly twenty-five water-works superintendents who use the forms prepared by the N. E. W. W. Association, although they have been in use for fifteen years.

It is hoped that a discussion of the subject as a whole this year will lead to a stronger expression of interest and a step forward.

Since the whole subject is one which no one society can handle, a proposition for a conference committee is in order, and will probably be made at Milwaukee. If two or three societies interested in the more strictly municipal lines of work should unite, much additional force would be given to the movement. But if such joint action is impossible, the province of the A. S. M. I. is sufficiently distinct to warrant individual action on the list of municipal activities which it represents.

More Machine-Made Editorial Indorsements. The *Southern Review of Commerce* may think that our free advertisement of its methods and those of the *Southern Trade Record* in these columns may be of some benefit, as two of our advertisers have sent in letters from that paper containing proposed "editorial" indorsements with the accompanying price list of extra copies of the number containing it. This indicates that our advertising columns have been used as a source of names. The number of combinations of a given number of ideas can be stated with mathematical exactness. Each of the five editorial indorsements now available for comparison has all these ideas and one can not be distinguished from another as a whole, yet each is stated differently and a comparison of details will show large differences in form of statement and arrangement of matter. There is evident failure to make the "thorough research and exhaustive investigation in regard to any manufactured product or the standing, ability or capacity of any firm, individual or

corporation about which our readers may be in need of facts"; and they did not "receive the full and detailed reports of representatives engaged in this investigation" before giving "unqualified indorsement to ———," as having "consummate skill and ability and a long and varied experience in this line." For in one case no idea is given of the "line" in which the engineer is working and in another case the letter was sent to an office from which the firm had removed more than two years before the date of the letter. The quotations are taken from the several editorials without reference to which paper they purport to come from, and give the themes of which the editorials are the development. They are as amusing—and as tiresome—as a lot of rag-time variations.

London Meeting of the Am. Society C. E. The London convention of the American Society of Civil Engineers was very successful, both as a regular meeting and as a medium for the exchange of international courtesies. The topics for discussion at the meetings were high buildings, rail manufacture and filtration of water. Prominent engineers in each field opened the discussions with good papers, followed by other papers, presented by both American and English engineers, and by general discussion. The high reputation of the society for expert discussion of engineering questions was fully maintained. Nearly sixty members were in attendance, and, with their families and members of the mechanical, mining and electrical engineers' societies, made a very respectable gathering.

Among the special favors granted the society were visits to the great manufacturing establishments, to Windsor Castle, to Warwick Castle and Stratford, and a reception at the Guildhall.

The difference in age between the leading English engineers and the officers and members of the American society was so marked as to be noticed by many. Sir Lowthian Bell, who at eighty is still in active life, was one of the notable speakers on the subject of rail manufacture.

THE CESSPOOL.

A COMPARISON OF PRIMITIVE AND MODERN METHODS OF TREATING SEWAGE.*

By Leonard P. Kinnicutt, D. S.

Bacteria are a low form of vegetable organism which multiply by a process of transverse division. Though commonly considered as dangerous enemies they are in fact our greatest friends, for it is only a comparatively few species, those that exist on living matter, that cause disease. The great majority obtain their nutritive mate-

*From an address before the Massachusetts association of boards of health, July 29, 1900.

rial from dead animal and vegetable matter and resolve these substances into similar compounds, as carbon dioxide, water, ammonia, nitrates, which are the food supply of higher vegetable life. Were it not for the presence of these bacteria, disposing, as they do, of effete organic matter and changing it into plant food, human life on this earth would, seemingly, be impossible. These are the bacteria that are present by the hundreds in a cubic foot of air, and in a cubic centimeter of so-called pure water, and by the millions in a centimeter of polluted water, or of sewage.

Bacteriology as a science may be said to date from Pasteur's experiments on the causation of the putrefaction of beer and the souring of wine, in the middle of the present century, and it is only at a very recent date that there was any reliable knowledge as to the action of bacteria in the purification of sewage.

Fresh sewage contains, in immense numbers, the class of bacteria which live on dead organic matter and which causes its decomposition. These bacteria can be roughly divided into two great groups, each containing numerous species. These groups are called the anaerobic and the aerobic groups. The anaerobic group embraces all those species that live, grow and multiply out of contact with air and light; the aerobic, those species that live, grow and multiply best in air and light. Each group plays its own special part in the destruction of effete matter and the organic substances contained in household waste. The anaerobic bacteria act first. They disintegrate the solid animal and vegetable matters, liquefy them and bring them into solution. The aerobic bacteria act upon disintegrated and liquefied compounds and, by a process of oxidation, change them into harmless gases.

For the destruction of dead organic matter, both groups of bacteria are necessary; the anaerobic to disintegrate and liquefy the complex organic substances, the aerobic to change those simplified and liquefied compounds into harmless substances.

Taking the above as a brief outline of what takes place in the decomposition of excreted and effete matter, we are in a position to consider the changes that take place in the cesspool.

Into the cesspool enter all the waste products of human life, and with these waste products, millions of bacteria, both anaerobic and aerobic. But the contents of the cesspool being practically shut off from air and light, it is a most suitable environment for the development of the anaerobic bacteria. These bacteria immediately begin to act upon the solid compounds in the excreted and other household waste. The complex nitrogenous substances are broken up and liquefied, also compounds like cellulose in its various forms, like paper, starch, woody fibre, are disintegrated, and, finally, if the action continues a sufficient time, all that remains in a solid state are chiefly what we can call the ash or the mineral matter of the animal and vegetable substances that entered the cesspool. The action that takes place in the cesspool might be compared to the process of combustion. If the substances that entered the cesspool had been burnt in a furnace, we should have left behind only the ash, all else being given off in the form of various gases. In the cesspool the bacteria have taken the place of heat. All the solid matter that remains is the ash. All else, however, has not been changed into gas, but, to a great extent, into substances soluble in water.

Liquid that passes through the cesspool as it leaches through the soil, or as carried away by a drain and allowed to run on land, comes in contact with air, and the conditions become favorable for the development of the aerobic bacteria, and the final process of purification begins. The liquefied compounds are most easily acted upon by the bacteria, and the compounds changed, as I have said, into harmless gases and mineral substances.

It thus appears that our forefathers, without any knowledge of bacteriology, devised one of the most efficient methods for the purification of household waste and one which I will show in a moment that has, during the past two years, been utilized for the purification of sewage in large cities, and one that has great promise of being most successful.

The question as to the dangers attaching to a cesspool I do not at this time care to consider at any length; but it seems to me that the danger arising from the use of cesspools has been overestimated. Certainly, in the decomposition of the solid complex compounds of the anaerobic bacteria, a large amount of gas is given off. This gas, however, is composed chiefly, as I will show later, of carbon dioxide, marsh gas, hydrogen and nitrogen, and resembles concentrated sewer gas, but does not contain, as far as we know, any amount of sulphite of hydrogen or other poisonous gas.

If the liquid in the cesspool is on different levels at different times so that the sides at times become dry, there may be danger of some pathegenic germs being in the gas that escapes from the cesspool, but the above condition cannot exist if the inlet pipe enters the cesspool at a lower level than the exit drain.

If the liquid in the cesspool percolates through the sides of the cesspool and the soil is hard clay, it may, while still containing a large amount of soluble, polluting matter, enter a water supply, as a well or a stream; but if the cesspool is in sandy soil there is very slight, if any, danger, as late experiments have shown that organic matter in the condition that it is in on leaving the cesspool, is changed with the greatest rapidity into absolutely harmless compounds. If the liquid is carried by a pipe from the cesspool and discharged over land or near a well or stream, it seems that there could be no danger. As to the escape of any dangerous gas from the soil near a cesspool, I do not see how it is possible.

Having thus tried to answer the question why cesspools do not quickly fill up with solid matter, and also to describe what changes take place in the cesspool, I wish to describe how this method has been made use of by sanitary engineers for treating sewage on a large scale.

Mr. Scott-Moncrieff, the well-known sanitary engineer of Ashland, England, was, I believe, the first to recognize that the bacterial purification of sewage took place in two stages, and that the first stage should serve as a prelude to further treatment. He erected, in 1891, at Ashland, a tank, or cesspool, for the express purpose of liquifying the solids in sewage, in which the sewage was forced upward over a bed of stones.

The credit, however, of showing that a modified cesspool could be advantageously used for the treatment of sewage of cities and towns belongs to Mr. Cameron of Exeter, England. The process was named by him the septic treatment, and it is by this name that it is now known.

He built at Exeter, England, an underground tank of cement concrete, sixty-five feet long, nineteen feet wide and of an average depth of seven feet, and having a cubical capacity of 53,000 gallons. The tank was covered with a concrete arch and a portion of the tank near the inlets was made about three feet deeper than the rest and partially cut off by a low wall, forming a couple of pockets or grit chambers to retain sand, grit and road washings. The inlets were carried down to a depth of five feet below the surface, so that air could not make its way down with the sewage, and also so that gases could not escape from the tank back into the sewer. The effluent outlet was also below the level of the liquid, and, to avoid any current that would be liable to carry with it any of the floating matter from the surface, a cast iron pipe was carried across the whole width of the tank fifteen inches below the surface, and on the lower side of this pipe there was a continuous opening about one-half inch wide. An iron pipe, about one and one-half inches in diameter, extended out of the top of the tank to allow the escape of gases which were formed, and the sewage in the tank could be inspected by opening a manhole constructed in the center and having glass windows.

At the plant at Exeter there are also five beds thirty-six feet long, twenty feet wide and four feet deep, made water-tight and filled with crushed clinker or coke breeze. Such beds are admirably adapted for the cultivation of aerobic bacteria, and the liquid as it comes from the tank, having undergone the first stage in the process of putrefaction, is now in just the right condition to be acted upon by the aerobic bacteria.

In August, 1896, the main sewer of St. Leonard's, a suburb of Exeter, with a population of 1,500 and an average daily flow of sewage of 57,000 gallons, was connected with the tank, and the above volume of sewage has been continuously passed through the tank since that time. The effluent from the tank falls over a wall about one foot high, which effects slight aeration, and then by means of the alternating gearing is caused to pass automatically on one or the other of the beds.

Visiting the plant the effluent from the tank first strikes the attention. It is a brownish colored fluid, free from palpable suspended matter, but does contain solid matter in a state of very fine subdivision, almost like river salt. It has an odor, but at the four different places where I examined it the odor is not more offensive than that given off from the first or second basin used in the chemical precipitation process.

The liquid in the tank is covered with a thick, floating mass, dark brownish-yellow

in color, through which bubbles of gas are continually breaking. It appears to be composed of organic matter, but in fact I believe it is principally a mass of micro-organisms, and it is not until this floating mass has been formed that active sceptic action takes place. At the bottom of the tank there was last summer a deposit two or three feet in thickness, the accumulation of three years, as the tank has never been cleaned out. This deposit looks like sewage sludge, though it contains much less organic matter. From the iron pipe at the top of the tank issues a volume of gas which, when ignited, burns with a colorless flame about one foot in height. The unignited gas has no very marked odor, and does not contain appreciable amounts of sulphide of hydrogen.

What are the changes that take place in this tank? They are exactly those that take place in the cesspool. The most marked change is the disappearance of solid matter, and it has been demonstrated that from one-half to two-thirds of the total solid matter has decomposed and liquified.

In this decomposition a large amount of solid matter is changed into gaseous compounds, as ammonia, carbon dioxide, marsh gas, hydrogen and nitrogen. Of these ammonia and part of the carbon dioxide remain in solution, while the others, being insoluble in water, escape from the tank.

That a large volume of gas is given off from the septic tank is seen not only at Exeter, but everywhere the septic tank is in use. The gas at Exeter burns with a flame over one foot in height. The only determination as to the amount of gas that is given off is, so far as I can learn, one that was made by H. W. Clark, chemist for the Massachusetts State Board of Health, working with a very small experiment tank. His results indicate that from .5 to .6 of a cubic foot of gas are formed from 100 gallons of sewage.

Analyses of the gas have, however, been frequently made, and though of course, it must vary greatly from time to time, the following analyses, made by Dr. S. Rideal, give an idea of its composition:

Carbon dioxide	0.3 per cent.
Marsh gas	20.3 per cent.
Hydrogen	18.2 per cent.
Nitrogen	61.2 per cent.

Who first saw that asimilar action to that which takes place in a closed tank must also take place in a large open tank is not known. Undoubtedly the same thought occurred to many persons at about the same time, for, of course, the conditions in both must be practically the same.

No free oxygon can be present in an open tank when full of sewage, and the sewage containing, as it does, a large amount of suspended matter, very little light can penetrate down from the surface. Whoever may have first used an open tank for septic action, I found them last summer being used experimentally at Accrington, Huddesfield, Leeds and Manchester. In all these places an old tank, which had formerly been used for chemical precipitation, had been turned into a septic tank, all the charge necessary being to place the outlet so that effluent opening should be three to four inches below the surface of the liquid, although, of course, in the building of such a tank it would be better to have the inlet also beneath the surface. In all these places the general appearance of the liquid in the tank was the same, very dark and opaque, the surface coated with a thick layer of solid matter, and the activity of the action in the tank shown by thousands of bubbles of gas escaping through this layer of solid matter. The effluent was of a dark brown color, containing suspended matter in a very fine state of subdivision, but neither the odor given off from the tank or from the effluent was so offensive as to prevent its use by towns or cities. That the action which takes place in the open septic tank is very similar to that which takes place in the closed tank is shown by a series of experiments made by Mr. Fowler at Manchester. He made daily analyses for one month of the effluent from an open tank and of the effluent from a closed tank, both being supplied with the same sewage. The following table gives the average of these daily analyses. The results, as seen, are almost identical:

Parts in 100,000.	Open tank.	Closed tank.
Free ammonia	3.20	3.10
Albuminoid ammonia	0.50	0.51
Oxygen consumed	8.46	8.43
Chlorine	16.40	16.10

The real practical value of the septic tank, or we might say the cesspool, is that it destroys suspended matter without forming any great amount of sludge or precipitate, thus having a great advantage over any chemical precipitation process. That it seems to bring cellulose into at least partial solution, thus preventing the coating over of bacteria beds, either those of inter-

mittent filtration or contact, with a layer more or less impervious to water. That it breaks up the more complex organic compounds, forming substances that are more easily acted upon by the nitrifying bacteria than the compounds in raw sewage. There is also another advantage in the use of the septic tank that it seems to me may be of great importance. In all bacterial treatment of sewage the changes that we have followed in the septic tank take place, but in the systems of intermittent filtration beds and contact beds the second phase of purification, nitrification, is also being carried on at the same time. If in either of these systems too little air is supplied, the aerobic or nitrifying bacteria cease to work, their place being taken by the anaerobic bacteria, which are unable of themselves to finish the process, and whenever the anaerobic bacteria have obtained the upper hand, as is the case when a bacteria bed is overworked, the bed becomes foul and the product obtained is similar to a septic tank effluent. By using a septic tank, allowing the effluent to come in contact with air and then passing it onto a bacteria bed, the two phases of purification are kept separate and better work is naturally to be expected.

I stated at the beginning of this paper that what we hold as true today we are told tomorrow is false, and so, in a year or so from now I may come before you and say that the changes that take place in the cesspool are not due to bacteria, but are due to chemical action; and I say this now because there are certain facts that point in this direction. There is a class of chemical substances known as enzymes, or unorganized chemical ferments, which are the products of vegetable and animal life, and which, in minimum amounts, without being themselves used up, are able to break up and decompose large amounts of complicated and insoluble compounds. Thus the enzyme known as distaste decomposes starch; lifase, many fats; cytase decomposes and dissolves cellulose. These enzymes seem to decompose the complex organic substances by what, chemically speaking, is called hydrolysis—the breaking up of a compound by the addition of water. In this way substances like albumen may be broken up with the formation of nitrogen, ammonia, hydrogen, marsh gas and carbon dioxide. Many of the enzymes being the products of anaerobic bacteria, they would naturally occur in the septic tank, and a large amount of the decomposition may thus be chemical, rather than bacterial.

Whatever is the cause of the changes that take place in the cesspool or septic tank, the changes are those that I have described, and I only hope that I have been able to point out to you that the most modern method of treating sewage is, in fact, the method of our forefathers.

WHY SOME MUNICIPAL ELECTRIC LIGHT PLANTS DO NOT PAY BETTER.*

By Geo. D. Shepardson.

Some of the reasons advanced by advocates of municipal ownership are:

The municipality should control the public utilities that affect the safety of the people. Therefore, it is warranted in supplying water for fire and sanitary purposes, constructing sewers, maintaining fire, police and health departments. The town should see that the streets are lighted for safety at night. How can it be done better than by the town itself, rather than by contract?

Some claim the town has no moral right to place the furnishing of necessities of life in the hands of "a legalized private monopoly with unrestricted powers," and leave the people helpless at the mercy of a corporation whose very existence was originally by the grace and favor of the people, a free gift at the hands of its later victims.

Since there is room for only one water works system, it being perhaps "a natural monopoly," the town is warranted in furnishing water for private use. In smaller towns there is not business enough to warrant starting a company lighting plant unless a favorable street lighting contract is secured. Hence if the town lights its own

* Condensed from an address before the Northwestern electric light association.

streets, it must also furnish electric lights for private use if the citizens are to enjoy these luxuries at all.

The town can furnish electric lights cheaper than a company, since it need not earn any dividends and pays no taxes. Some maintain the plant need not earn interest on the money invested, for the plant is bought with the proceeds of bonds, the interest on which can be charged up to general expenses of the town. Even if interest is charged against the plant, the municipality can hire money at a lower rate of interest than can a private corporation, since the whole property of the town is security and not simply that in the plant for which the bonds are issued, and the laws are such that the taxes can be collected without fail. On the other hand, the plant alone is security for bonds or other funds hired by a company.

Some also maintain that the plant need not earn anything for depreciation, surplus or sinking fund, for this can also be provided for by addition to the tax levy and the people would never know the difference.

It is claimed that the plant can be operated more cheaply by the town, for it need cost nothing to handle the business, since the town officials can keep the accounts and make collections as a part of their regular duties.

When the town already has a water works plant in operation or in prospect, it can supply electric light and power with little additional cost, since the building, boiler and men are already there, and it takes only a little more coal and wages to run the electric plant.

Perfect honesty may be expected in the administration of the affairs of electric light and water works plants in all except perhaps the largest towns, for in smaller places everyone knows everyone else and all his affairs, the public affairs are known to all and there is no chance for stealing or other corruption. There may be aldermanic steals in large towns like New York and Chicago, but never in our town.

The large dividends on watered stock of gas and electric companies show that there is a large margin, which might be saved to the consumer in the case of municipal ownership.

By operating a municipal plant, prices will be so low that electric lights can be enjoyed by poor people and not by the rich only. As a matter of fact, the prevailing prices for street and commercial lights are considerably lower with municipal plants than in other towns with private plants.

Public affairs are not usually administered as economically as private affairs, hence public utilities should be in the hands of private parties for best economy. The administrators of a public institution, such as a water works or electric light plant, do not have the self-interest of those operating a private plant, for they are not usually expected to earn dividends, nor are they so closely watched, as "everybody's business is nobody's business." "Private management, in comparisan with public management, is at least 20 per cent. more efficient, saving and economical in every way, as a direct result of the self-interest in a profit producing industry." All other things being equal, this 20 per cent. more than offsets any advantage public ownership may have in reducing costs, and it enables the private plant to earn a reasonable dividend while not increasing the actual cost of service to consumers.

Even where the officials are perfectly honest, public affairs are always administered less economically than private, the hours being shorter, the pay being higher as a rule, while the supervision is less exact.

Political pull usually puts the best men out and puts political loafers in positions where their ignorance, laziness and general incompetence militate against efficient operation of the plant.

The feeling that politics counts for more than merit prevents the employes in a municipal plant from having the proper ambition to excel that would exist in a private plant or in a public plant where civil service principles prevailed.

Even in the rare case where merit tells more than "pull," the city council changes its make-up every one or two years and a new committee is appointed to have general oversight of the city water and lighting interests.

These green committeemen must show their ability by insisting upon the superintendent following their notions, even against his own convictions. They stand in the way of his getting supplies and apparatus that he really needs, while they are quite willing that he should lay in large supplies of such sort as appeal to them. The superintendent is therefore apt

to be extravagant in some directions while he must be niggardly in others, both of which militate against the economical operation of the plant.

While the municipal plant has no taxes to pay, the town is not the gainer thereby, for its treasury loses practically the same amount which the company plant would have paid. There may be an immediate saving to the town, since the company's taxes would have been divided among the town, county and state, so that the county and state lose some revenue in favor of the town owning a municipal plant. The handling of municipal property is notoriously corrupt, even outside of the larger towns.

The periodical waves of "turning the rascals out" and reforming the public expenditures, generally mean that the salaries of the superintendent and engineer are cut to such a point that no competent man can afford to retain his position, and incompetent or dishonest men take their places. It is true that "the corporation that pays small salaries in order to pay larger dividends will have to pay larger salaries in order to maintain dividends." A similar statement is true regarding salaries in municipal plants.

As a result of the incompetence or lack of appreciation of the situation on the part of the superintendent or city recorder, the records of many municipal plants are in such shape as to give little information as to the exact condition of the plant. In some cases there is not a complete record of bills receivable. Many have no record of the output of station, coal or water per kilowatt-hour, or even number and location of services, meters and lamps. Such things as pressure wires are unknown in many plants, and the lamp voltage varies to such an extent as to render the use of economical incandescent lamps out of consideration.

The reports of the low rates with municipal plants are due to several causes, usually to ignorance of the real cost. Expenses that should be charged against the electric plants are often placed against the water works or against the general fund, and are often ignored until it becomes necessary to pay some bonds. Depreciation is often not considered, and when something finally gives out, a special appropriation is made for renewals and is charged against something other than the operating expenses of the municipal lighting plant. The result is that the rates received for electric lights are often considerably below actual cost to the town, and the saving to the people who take electric lights is made up by increased taxation of the whole people. If the town sells electric light below cost, it should in all reason furnish kerosene and candles at proportionally low figures. And why not groceries and dry goods likewise?

The argument as to the danger of placing the supplying of necessities of life in the hands of a private monopoly does not apply to electric light plants. If the service and rates are not such as to seem fair and reasonable, customers will reject electric light and will fall back upon other illuminants. Self-interest, therefore, prompts public supply companies to offer the lowest rates consistent with reasonable profits. Witness the active efforts of gas and electric companies to increase their business by all sorts of advertising, and note the continual reduction in prices as the earning capacity of the plant grows. It should be recognized, however, that the excuse for municipal ownership where private plants already exist, is often charged to alleged unreasonable and monopolistic attitude of the local company.

Public sentiment is not always based upon ultimate truth, being moulded often by specious arguments that later prove defective. In the end truth prevails. Much of the contention for municipal ownership of public utilities comes from the circulation of incorrect reports of relative cost. A number of municipalities have learned by experience that it is cheaper to obtain electric service by contract rather than by municipal operation. To this day there is open the standing challenge of a well-known advocate of private ownership, that "There is not a municipally-owned gas or electric light plant in the United States which private capital will not take over and operate under contract at the same price the service is now costing, all factors of loss being correctly and fully considered, and all franchise rights enjoyed by the municipality being assigned to the purchasing private corporation."

The talk about giving away franchises is largely based upon a lack of appreciation of the benefits that accrue to a town by the investment of private capital in public utilities, increasing the advantages and facilities of the place, making it more attractive to other capital, bringing in new industries, increasing the population and

greatly improving the conditions of living in the municipality. Concessions, percentages of income and other burdens are increasingly laid upon seekers for franchises. But it is also true that the companies recognize more than formerly the fact that obligations between the company and town are mutual.

In spite of the talk about large dividends on watered stock, it is probably true that the majority of central station owners would willingly sell out to the municipality at a reasonable price established by unbiased and capable appraisers.

From personal knowledge and the contributions of friends whose testimony is believed reliable, the following incidents are culled to show how the efficiency of municipal plants is less than called for by the theories of some political economists (private plants are far from perfect in their operation, and equally bad examples could be drawn from knowledge of their interior workings, were that subject under consideration at present). The illustrations point out the incompetence of those in charge of plants, the poor systems of records, the too-cheap economy in design and operation of plants, the low rates, the dishonesty of aldermen and the baneful effects of politics.

The state of the records kept in some of the municipal plants is almost incredible. In several towns there is no complete record of the service connections to the waterworks and electric plants. In one place a new superintendent found it necessary to shut off the water to enforce the payment of back water rents. There was no plot of the water mains or services. He therefore was compelled to open the streets and search for the cutoffs, for which purpose the services of a chain-gang from the county jail were secured. In another town, when the collector was getting a promise of payment from a merchant, he was requested to bring in the bill for the meter in the barn at the same time. The collector held his own council and discovered a meter with a number of lights for which no record could be found. In that town, the only account books found were an electric light book with monthly columns for accounts of customers and an individual account book for water consumers, there being no record of purchases, repairs or any other expenses. In another place, by a careful canvass of the town and examination of the lines, water and lights were added to the record of about $900 income per year, and no one knew how long they had been getting free service. In another place where the rates are low and the water power leaks badly so that it is necessary to spend several thousand dollars at once, the superintendent is confident that the plant is clearing about $800 net profits per month. In another town "there are no records and no system of accounts."

Closely allied to poor systems of bookkeeping is the incompetence of the city clerk or collector who has charge of records and collections. They do not understand the business and naturally do not make it pay. "The collector knew practically nothing of the station working, was ignorant of the station output, amount of coal used for electric part of plant, etc." "Owing to inefficient and incompetent officers, all sorts of prices were charged for supplies and work furnished the city. For example, a plumber was paid $2.20 for a common valve costing 90 cents, and other items in proportion." In another place the innocent recorder was beguiled into paying a higher price for a new lot of incandescent lamps, 'because they had more watts than the kind formerly used.' "

The committees of the town councils are often "green hands" and of little value in administering municipal plants. In one place a former collector had been found short in his accounts and a committee was appointed to check his work. After two days upon his books, they made a report upon the shortage, which was made good and the bondsmen were immediately discharged. Soon after, when the water rents came due, a number of people were found to have receipts for dues which had not been credited on the books, but the man's bondsmen had been released, and the town had a considerable sum to charge to profit and loss. A committee went over a lot of old accounts and found that their predecessors had approved reports in which there were serious defects, but lest they should seem to reflect on the abilities of their friends, the superintendent was instructed to call it square and open a fresh account with each person whose accounts were found faulty in former reports. A case recently occurred in a neighboring state to show how shortsighted some councils are in regard to franchises. A company applied for a franchise to furnish light and power from a water-power not far away, intending to spend about $30,000 in the plant. After dallying along for some time the franchise was granted by the council, but vetoed by the mayor, who wanted a municipal plant,

Although the town was already within $8,000 of its bond limit, they voted bonds in that amount to build a plant, hoping in some providential way they could put in a plant. In one town where a committee of the council was supposed to keep track of matters, a superintendent managed to do away with over 1,000 lamp renewals in a single year of which there is no account. Over $300 worth of fixtures sold without record were traced.

The superintendents of municipal plants are often incompetent. The superintendent of one plant where they still use 50-volt transformers, heard of the saving in using large transformers. So he bought one and tried to supply 50 lamps one block distant by a No. 6 wire. (Assuming one ampere per lamp and 400 feet to the block, this would give a drop on the line of about 22 volts). The superintendent was sure that No. 6 was large enough, for the insurance rules said it would carry it all right. The trouble was therefore in the transformer, and he compelled the agent to trade it for three small ones. The large one "did not regulate" as well as the small ones and he is sure that the modern idea of large transformers with secondary networks is a mistake and a failure, for he tried it. In another town of about 4,000 inhabitants, a technically trained superintendent is saving about $5,000 annually above the records of his predecessor. In a smaller town a similar man is saving between two and three thousand dollars annually to the town on account of more skillful management. He increased the revenue by $100 in a single month by using better transformers and lamps, although the station output was 10 per cent. less. The station output was materially lessened by inspection of the circuits, and tying up the lines where they had fallen upon the cross-arms. Incandescent lamps on flat rates taking 58 to 70 watts were replaced by 53-watt lamps with marked economy. In another station the superintendent confided to an agent that he was bothered about learning the frequency of his alternator. The agent said it was too complicated a matter for him to figure off-hand, but he would calculate it when he returned to his office. The agent found that the practice of his own company in similar case was to use 125 cycles and he reported that the superintendent had such frequency. As a matter of fact it was 140, and the speed was marked on the machine. In one town the chief reason why one alderman voted in favor of one system against a lower bid was that his preference was the machine with "kilowatts," while the cheaper machine was a "multipolar" machine, and he preferred kilowatts to multipolars.

In the laudable endeavor to secure economy, the mayor and council frequently lose at the bung while saving at the spigot. This occurs both in the first purchase of the plant and in its later operation. After one town had voted to put in a lighting plant, the mayor took a trip to learn what he could. After consulting with several agents and getting propositions from them he called upon an engineer who was given to understand his services would be required. After spending some hours pumping him, the mayor left and went home, where he concluded he was enough of an engineer himself to lay out the plant. So he bought some machines, hired a wireman and the plant was put in. At another place a resident bought up some second-hand machinery, and after putting it into operation sold it to the town for what it would cost when new. In a few weeks they had to spend about a hundred dollars for repairing the armature, and then had to buy a new machine.

At another place they decided to secure a cheap engineer to design their plant. He specified a 20-horse-power gasolene engine to operate a 600-light dynamo, and, in addition, to drive the pumping machinery for the water works. The council made a contract for the gasolene engine as specified, including a proviso that if a steam plant was substituted, the gas engine contractor was to receive a commission of 15 per cent. of the cost of steam plant. It is reported that this was actually done and paid. Two of the larger towns of the state were contemplating municipal ownership, and each secured the services of an inexperienced young man to prepare plans and specifications for the plants, in one case because he was a friend or relative of one of the committee, in the other case probably because he was cheap. The country is full of half-baked electricians who pose as engineers and as advisers to investors.

There is frequently an attempt to reduce operating expenses too far. At one place the council discharged a good engineer and hired another because he was cheap. Within three days he got his cylinder full

of water and broke the girder of the Corliss engine. It is common, even with privately-owned stations to attempt economy by hiring cheap firemen, since anyone can shovel coal or throw wood. But owners fail to recognize that by paying ten to twenty dollars more for securing a capable fireman they are apt to save his extra wages several times over in reduced fuel bills.

In some cases there is great loss on account of downright dishonesty of the superintendent or the council committee. "A city employing an honest superintendent, with liberal pay and some backing in the council, will often prevent small and also large steals which are almost invariably found in municipal departments, such as lamp renewals (on which it is difficult to keep accurate account or check), 'rake-offs' on purchases for the plant for which in the end the city pays. One supply company offered a new superintendent as high as 20 per cent. on all purchases the year round, as they had always done so. This is substantiated by old bills. Lamps are checked up once a month while burning and one is often asked to go easy in counting, being offered all sorts of bribes from cigars or drinks to considerable sums in cash. I know of officials receiving special concessions in this way amounting to several hundred dollars per year. All this could have been prevented by a proper system of checking, but at best comes down to one man being honest. "Car loads of wood have been sold 'by the car' by former superintendents. An investigation by an alderman indicated that a loss of over $1,000 per year had been received from that source alone." In another place the city recorder is said to collect the accounts and sometimes sublets the job to his friends who knock down about half and turn the balance over to the recorder, who in turn transmits to the treasurer so much of it as suits his convenience, there being no records and no other system.

The political conditions prevent best results in many plants. Where the employees are appointed by aldermanic influence it is not uncommon for an underling to retort to his superior officer when corrected for some shortcoming, "Oh, well, I have more pull than you have, and what are you going to do about it?" In one town until recently the plant was operated by two parties, an engineer, who took care of the station, and a lineman in charge of outside work. These parties were not on speaking terms, and, of course, each attributed all trouble with the lights to the other man's part of the plant. This state of affairs continued for several years, during which time the arc system was in bad condition, the lineman attributing it to the dynamo and the engineer laying it to the lamps. When a change was made, there were two applicants for lineman, one a young man who would have attended to business, the other was a young son of one of the aldermen and with little experience or ability. There were also two applicants for fireman, one a good man and the other a lazy, good-for-nothing fellow who claimed to have considerable influence in the country so that he could turn considerable trade to some of the stores in which the aldermen were interested. By combining forces the poorer man was appointed in each case. There is a continual struggle between the temperance and the saloon element in most of the towns and when a new election puts the opposition into power, the superintendent is almost sure to lose his place in favor of some friend of the new management.

The incidents noted above show that the question of the desirability of municipal ownership is one complicated by many elements that are often lost sight of by the advocates of municipal ownership. After all is said, the arguments must be modified by the "personal equation." It is largely a question of circumstances. A community, whether a hamlet or a metropolis, is a co-operative institution and should be run on business principles. Some manufacturing concerns find the best economy and the most satisfactory results in making all their product from the raw material. Others, differently situated with respect to plant and market, or with respect to character and constitution of the officers, find it more satisfactory to sublet the contracts for the manufacture of parts, confining their attention principally to assembling and marketing. Each may be doing the best thing under the circumstances. In the same way, some communities may find municipal ownership to be more economical and satisfactory than private ownership. A much larger number than is generally supposed find it really better to purchase their lights from other parties.

SEWER MAINTENANCE.*

By W. C. Parmley, C. E.

In considering the social conditions under municipal organization the sanitary welfare of the people is of the first and greatest importance.

He who spends money for fine paintings while his children cry for bread commits no greater crime than the city which spends vast sums for public conveniences or in beautifying the landscape unless, first, human life and health be well guarded.

In relation to the public health of any city, two factors are of paramount importance: First, a pure water supply, and, second, an adequate and efficient system of sewerage. It is to the second of these, the sewerage, that I wish to direct your attention at this time, and more particularly to the maintenance of such system after it has been put in operation.

The city of Cleveland at the present time has a vast network of sewers, aggregating 257 miles. These sewers already extend their benefits to the greater part of the city and are rapidly reaching for the outer limits. But, after they are built, what is being done to keep them in a sanitary condition? In the year 1898 the total amount expended for cleaning and repairing was less than $20,000, or, by the annual report of the superintendent of streets, $19,592.91, a small amount to keep clean and in order a system costing over $6,300,000 to build.

It seems well-nigh impossible for man to outgrow the weakness expressed in the saying, "Out of sight, out of mind," and because a sewer is buried beneath the surface, the mere knowledge that such a conduit exists, no matter what its filth may be, seems to satisfy the general demand. Yet, as our eminent sanitary engineer, Mr. Rudolph Hering, has truly said, "a sewer will never be anything but a powerful enemy in our midst, and if not under perpetual supervision will some day bring sorrow to our homes. To reduce the evil to a minimum it is absolutely necessary that all works be designed, built and maintained according to the latest and most approved methods of the science of sanitary engineering, and should have far more care bestowed upon them than is generaly done or is believed to be necessary."

A sewer can no more be built and then left to take care of itself than can a building, a bridge, a pavement or a machine. Because it is buried from sight, and therefore out of mind, it becomes an enemy all the more insidious and dangerous. If the surface of the street becomes foul and unsightly public sentiment will require its cleansing, but the contents of a sewer may become a putrid and filthy mass and, by the escape of its effluvia into our dwellings through some unknown defect in plumbing, cause irreparable injury before its condition is suspected.

At the present time it seems to be popular, even among engineers, to disarm the old bugbear "sewer gas" of its supposed terrors. While it is acknowledged that there is no such gas, I think no one will contend that the emanations from a foul sewer are wholesome. On the contrary, their effects are so slow and insidious, so secret in their workings, that when their deadly work is done the true cause often remains unsuspected, while a less important and more immediate or noticeable cause bears the blame. Foul air weakens the system and renders it vulnerable to attacks from disease which otherwise would be harmless. The city of Milwaukee furnishes an illustration of this evil of unclean sewers. The city engineer, from data collected by him, observed a prevalence of disease in portions of the city where sewers were not properly cleaned.

The causes affecting the death rate are complex and varied in the extreme, involving the quality of the water supply, climatic peculiarities, habits of the people in each locality and general configuration and drainage of the surface. The entire sewerage system of any particular city usually receives the same amount of attention, whether that be much or little. It is impossible, therefore, to state numerically just what effect the foulness or cleanliness of sewers has upon the death rate, but all authority is agreed that matter once reaching a sewer should be carried to the outlet before decomposition has begun.

Granted, then, that sewers should be kept fairly clean, we may profitably consider the present method pursued in our city, its defects and some methods of remedying them.

* From Journal of Association of Engineering Societies; read before Engineer's Club of Cleveland.

Under the present organization the maintenance of sewers is in charge of the street department and thus entirely disconnected from the engineering department, under which they were constructed. The street department is also engaged in the duties of cleaning the surface of streets and repairing defects in surface improvements. This field of activities in a large city requires a considerable force of workmen, and the proper and economical management therefore becomes correspondingly difficult. A small force of men is employed repairing sewers and cleaning catch basins. Another gang is occupied in flushing and cleaning out sewers where stoppage has occurred. These gangs are liable to a call to any part of the city, and their immediate duties depend entirely upon the urgency of the call. Sewers are inspected and cleaned only upon complaint or in cases where the department knows that they need frequent attention to keep them in operation.

The defects of this method are many, and for the most part obvious. Among these we may notice:

First—The magnitude of the work of keeping our streets clean is sufficient to occupy one well-organized and well-equipped department.

Second—The street department, having the care and maintenance of the sewers, is entirely disconnected from the engineering department, where all the sewers are designed and where all the records are kept. It, then, does not posses the necessary records, maps and other data to enable it in the most comprehensive and economical way to care for this vast system of sewers.

Third—Owing to the insufficiency of the force and organization of the work, no knowledge is had of the condition of a sewer until some complaint of its foulness is made or the sewer is entirely stopped by the accumulation of deposit. It thus happens that many, indeed, most, sewers are never examined after they are accepted from the contractor, and it has been found upon examination that in some of the sewers rubbish has lain for years obstructing the free flow of the water.

In many cases mortar dropping from the masons' trowels and adhering to the walls of the sewer has never been removed. The capacity of the sewer is thus lessened, and the tendency to foul deposits greatly increased. While the city was at fault in accepting sewers before the mortar was cleaned from the walls, the fact remains that a large number of our sewers should be thoroughly scraped before they can be properly maintained.

Fourth—In consequence of these facts, a large number of our sewers are ordinarily in an unsanitary and filthy condition, endangering the health of the people and liable to produce damage by flooding at times of storms.

Recently something like one hundred examinations of lateral sewers were made to determine the condition of those cases where the flow of water is insufficient to carry off the heavier matters reaching the sewer. The conditions revealed are difficult to describe, and would naturally startle one not familiar with such sights. In many instances the deposit varied from a few inches to over a foot in depth, over which meandered, in sluggish, tortuous course, a tiny filament of semi-liquid putrifying filth.

Fifth—The present spasmodic and local methods of flushing too often flush the sediment from one portion of the sewer to some other portion farther down the stream, thus making the condition at the latter point worse than before.

Sixth—The condition of our catch-basins is unsatisfactory as now maintained. Under the present system the catch-basins are cleaned by contract at the rate of 59 cents per basin. The contractor cleans those designated, and as often as ordered by the superintendent of streets. About $6,000 are spent annually for this work, in addition to cost of repairs and cost of cleaning and flushing inlet connections with these catch-basins, which is done by the street department and charged to the several sewer districts.

It is not known just how many catch-basins there are in the entire city, but the number is estimated at not less than 8,000. With the expenditure of only $6,000 annually it is easily seen that each basin can not be cleaned as often as twice a year As a fact, the basins in localities where they fill up most rapidly are cleaned more often than this, but many other basins are not cleaned as often as once a year. The general result is that during the summer months catch-basins as a rule stand partially or entirely filled with decomposing filth, and the offensive odors arising therefrom are often apparent to the passers on the street.

While it is probable that the cost of about

60 cents for cleaning each basin is not unreasonable, it is painfully evident that they should be cleaned much more often, and that some adequate form of inspection should be maintained in order that they may not stand for weeks at a time as noisome and pestilential spots along our thoroughfares. An annual inspection of double the present amount would not be too much to keep these appendages to the sewer system in proper condition.

If the "white wings" system of street cleaning were established in our city, the cost for this item of sewer maintenance could be materially reduced and better results obtained.

Seventh—The present method is too expensive, considering the results attained.

To illustrate the actual cost under the present system of flushing sewers, I have chosen several of the cases of work done during the summer of 1899.

These examples show the cost for flushing and cleaning sewers exclusive of the cost of cleaning catch-basins or repair work on sewers or basins.

The cost for forty-seven cases, taken during the summer of 1899, aggregating about 9.75 miles of sewers, from 12-inch pipe to No. 7 brick, was $1,910, or an average of $196 per mile. More in detail we may give the following instances with the conditions and costs, which will be of value in comparing them with the costs of similar work in other cities:

Length. Feet.	Kind of Sewer. Inches.	Grade.	Nature of Work.	Cost per Mile.
960	10, No. 2	0.5	Simple flushing.	$40 70
1665	12—15	0.5	Simple flushing.	104 00
1623	12—15	0.5	Simple flushing.	90 00
912	No. 2	0.25	Sewer nearly filled with fine sand.	2,860 00
721	No. 2	0.3	Ordinary flushing.	79 00
1684	No. 2	0.25	Ordinary flushing.	33 10
2213	12—15, No. 2	0.4 to 0.65	Ordinary flushing.	46 70
3736	12—No. 4	0.3	Ordinary flushing.	55 90
1610	20 and No. 2	0.25	Sand less than 6 in. deep.	96 00
827	No. 2	0.30	Flushing.	67 30
658	12 and 20	0.3 and 0.4	Flushing.	84 30
689	Nos. 5, 6	0.3 and 0.8	Flushing.	28 80
833	15	0.25	Some sand.	101 00
1278	No. 2	0.5	Flushing.	21 80
1007	12	0.8	Some sand.	50 50
1332	12	0.5	Some sand.	73 50
779	12	0.4	Some sand.	84 80
779	12	0.4	Some sand.	190 50
802	12 and 15	0.32	Flushing.	82 20
1662	12 and 20	0.3 and 0.4	Some sand.	29 80
1600	Nos. 2, 4, 6, 7	0.25	Sand 1 in. deep taken out at M. H.	525 00
983	12	0.3	Flushing.	108 00
805	12—15	0.3	Flushing.	80 50
1443	Nos. 1, 2, 3	0.2	Sand 2 in. deep.	104 00
803	12—15	0.3	Flushing.	79 50
649	No. 2	0.3	Flushing.	58 70
873	12	0.5	Flushing.	86 40
1135	12	0.5	Some sand.	91 00
1133	12—15, No. 2	0.2 and 0.3	Flushing.	33 30
341	No. 2	0.25	Depression in sewer, dead water and sand.	880 00
1100	12, No. 2	0.2 and 0.3	Sand 2 in. deep.	299 00
1587	No. 2	0.25	Sand from 3 in. deep to ½ full.	483 00
587	12—15	0.25	Flushing.	121 00
1012	12—20	0.3 and 0.4	Flushing.	96 80
1643	15, No. 2	0.12 to 0.5	Light flushing.	14 10
1600	20 and No. 2	0.25	Flushing.	51 50
360	15	1%	Flushing.	115 00
583	12	0.7	Flushed rubbish.	518 00
1386	15	0.25 and 0.5	Flushing.	82 00
880	No. 4	0.25	Sand 1½ ft. deep. Sand flushed ahead by hose.	1,128 00
610	No. 4	0.25	Sand 6 in. to 1½ ft. deep, flushed ahead by hose.	1,195 00
1473	15—20, No. 2	0.3 and 0.6	Flushing.	143 50
988	15 and No. 2	0.5	Flushing.	126 50
528	20 Brick	0.5	Flushing.	61 60

In Cleveland egg-shaped sewers have the following elements for those mentioned above:

	Height. Feet.	Width. Feet.	Area. Square Feet.	Hydraulic Radius (Sewer full).
No. 1	2.25	1.50	3.41	0.518
No. 2	3.75	2.33	6.73	0.699
No. 3	3.83	2.84	8.35	0.702
No. 5	3.74	2.92	8.55	0.815
No. 6	4.22	3.33	10.90	0.930
No. 7	4.69	3.69	13.30	1.030

With these figures before us it will be instructive to observe what is the cost for similar work elsewhere. In order to obtain facts in regard to the maintenance of sewers I addressed letters to a large number of our more modern improved cities.

The cost for flushing and cleaning the sewers in the cities named is given in the following table. It seems apparent, however, that in some instances the cost given must include other items, or else there was some error in the figures stated. The fact of whether flush tanks are used or not and the number in use, together with the amount of pipe and brick sewers, is also stated.

TABLE I.
Showing Cost per Mile for Cleaning Sewers.

Name of City.	Yearly Cost per Mile for Cleaning and Flushing.	No. Miles Brick or Stone Sewers in City.	No. Miles of Sanitary or Pipe Sewers in City.	Number and Use of Flush Tanks.
Brockton, Mass.	$3.00 for pipe sewers. None for brick.	3.0	17	No
Buffalo, N. Y.	About $7.00	47.0	80	No
Chicago, Ill.	$16.06, including cleaning catch-basins.	597	880	10
Dayton, O.	About $12.80 for sanitary system.	68	81	Yes
Denver, Col.	$13.70	21.86	202.74	150
Indianapolis, Ind.	About $88.00 for cleaning and repairing	25	85	Yes
Lowell, Mass.	Practically nothing			No
Minneapolis, Minn.	About $13.11, exclusive of catch-basins.	108.05	58.7	70
Madison, Wis.	Not more than $1.00	0	61.75	308
New Haven, Conn.	About $15.00 for pipe sewers and $26.00 to $35.00 for storm sewers.	22.6	33.1	No
Newark, N. J.	$6.50	56.50	92.47	19
New York, N. Y.	Pipe sewers, about $20.30; brick sewers, $20.40	3887	1194	1235
Paterson, N. J.	About $200.00 per mile for pipe and brick	32	50	No
Rochester, N. Y.	When test pits are necessary, about $300.00 for pipe sewers, and from $750.00 to $1000 for main sewers.	68	122	No
Rockford, Ill.	Less than $10.00 per mile.	None	27	30
Salt Lake City, Utah.	$200.00 for outlet.	7	17.5	
San Antonio, Tex.	$17.50 for brick and pipe.	4	30	600
Spokane, Wash.	$13.00 to $20.00	0	18.3	65
St. Paul, Minn.	$16.50 for pipe and brick	50.10	100.84	6, or 5
Scranton, Pa.	About $6.00 or 9.10 being for catch-basins	2.5	98.75	No
Winchester, Mass.	$36.00	0	17.5	No
Youngstown, O.	$16.00	2.5		Very few

*In Borough of Manhattan. (Used but little. [In Borough of Richmond.

While it is apparent that there is a very wide range in the cost per mile in the different cities, depending no doubt upon the local conditions, methods of doing the work, etc., yet on the whole the cost in our city ranges very high, as shown, for the various cases given above. The cause of this excessive cost lies apparent on the surface. In each case where it exceeds a certain amount sand or other deposit has choked the sewer to a considerable degree. Had these sewers been cleaned before the accumulations had become so deep the cost for several cleanings would have aggregated so much as for one cleaning given, and the sanitary results would have been far better That our sewer cleaners are able to do a given amount of work at a reasonable cost is shown, I think, by the small cost per mile in those cases where the sewers were not seriously clogged by deposit.

This fact suggests in part the remedy for the present method of repair and cleaning

work. If the organization and appropriation for the maintenance of this department were adequate to the needs, cost for doing the work would then drop to a point comparable with the cost in other cities.

In order to indicate the general methods pursued elsewhere the following table is given, which shows what cities have indicated a preference for flushing with flush tanks and which prefer to use the hydrants. To indicate the kind of sewers and the number of flush tanks in use, these data are also added, as shown:

TABLE II.
Showing Method of Flushing Preferred.

Cities Preferring Flush Tanks.	Number Flush Tanks in Use.	Miles of Brick Sewers.	Miles of Pipe Sewers.
Atlanta, Ga.	190	13	70
Canton, Ohio	73	8	30
Dallas, Texas	30	1	43.3
Denver, Col.	150	250	200.7
Lincoln, Neb.	*40	2.6	23.4
Madison, Wis.	*30	0	21.8
New York, N. Y.	†150	300	1200
Peoria, Ill.	2455	19.8	30.4
Pueblo, Col.	50	0	45
Rockford, Ill.	30	0	68
San Antonio, Texas	1000	4	70
St. Paul, Minn.	¶4 or 5	50.1	163.6
Spokane, Wash.	60	0	18.5
Toledo, Ohio	22	134	18
Trenton, N. J.	100	11	22
Topeka, Kan.	197	3.9	61.9
Salt Lake City, Utah	0	7	97.5

Cities Preferring Hydrants.	Number Flush Tanks in Use.	Miles of Brick Sewers.	Miles of Pipe Sewers.
Binghamton, N. Y.	95	7.8	21
Duluth, Minn.	0	2.8	11.3
La Crosse, Wis.	80	1.3	7
Madison, Wis.	†30	0	21.8
Newark, N. J.	70	50.9	116.5
Spokane, Wash.	250	0	18.5
Wilmington, Del.	10	10	40
Youngstown, Ohio	3 or 4	3	

*Flush tanks are preferable for flushing.
†To be increased to 198.
‡Only 2 in use owing to litigation with water company.
§"More reliable, but less effective" than hydrants.
¶Preferred "if water is free."
‖Wagon tanks are used, but flush tanks are better.

*Have had 80 or more.
†Hydrants are best for removal of stoppages.
‡Hydrants best for stoppages only.

It is noticeable that, as a rule, those cities having most experience with automatic flush tanks express themselves as favoring this method, rather than depending upon the spasmodic or even regular use of a stream from a fire hose.

The question of the desirability of building flush tanks in the city of Cleveland is an important one. Our city contains no example of this modern apparatus. There are in the city approximately 950 sewer dead ends, which means that if a flush tank were constructed at the upper end of each lateral sewer the construction of 950 flush tanks would be required. In the near future the number would easily reach 1,000. The cost of these 1,000 flush tanks would be about $60,000. Suppose that thirty-year 3½ per cent bonds were issued to pay for their construction, the annual charge for interest would be $2,100, and the payment to the sinking fund at the same interest rate, in order to pay the bonds at maturity, would be $2,100, making a total annual cost of $3,300. The consumption of water, at 300 gallons daily, would be 109,500,000 gallons annually, at a cost of about $650. The cost of repair and maintenance, at 2 per cent., woud be $1,200. An estimated cost of attendance to keep them in operation, employing, say, five men, each inspecting twenty tanks daily, making a complete inspection about every ten days, at $1.50 per day, would be $2,250 per annum. The total cost of providing and maintaining such a system of flushing would thus be about $7,400.

At the end of the thirty yearrs the cost would be reduced by $3,300, or to $4,100 annually, providing the cost of repairs were not increased by rusting away of the cast iron siphons. As some castings would probably need replacing, we may set the average annual charge for maintaining these 1,000 flush tanks in operation after the bonds have been paid off at $5,000 a year.

The result obtained would be that the terminal portions of all lateral sewerrs would always be kept in a cleanly and sanitary condition, while the sewers more than 1,000 feet down-stream from the flush tanks would be only slightly improved thereby.

The use of the hose from hydrants would, therefore, be necessary on all main lines of sewers where the sediment tends to deposit. Since, however, the principal hydrant flushing that is done at the present time is on the upper ends of the lateral sewers, the cost for this flushing would be considerably decreased.

The proportion of the total expense of maintenance chargeable to this hydrant flushing and cleaning at the present time is not known, since the accounts do not separate it from the general charge for repairs on sewers. That much more in this line should be done is evident from the generally foul condition of the sewers.

In comparison with the work that should be performed by the 1,000 flush tanks, we may estimate that four gangs of three men each, with light wagons and apparatus, could flush all the sewers from the dead ends at least once a month. The scouring effect of each flushing would be greater than that obtained from the flush tanks, and would extend downstream a greater distance. The cost of this force annually would be about $7,200, or approximately the same as the cost of maintaining the flush tank system. If such a system were inaugurated I believe that the amount of flushing required on the downstream reaches of our sewers would be comparatively small.

While not prepared to advocate the immediate construction of 1,000 flush tanks, in my opinion it would be a good policy to build tanks at such points as show a special tendency to become foul.

The number to be built would be determined from examination of each individual lateral. Supplementing these with systematic flushing monthly, as indicated, of all dead ends not so provided would revolutionize the condition of our sewers.

It is common with us to let out the more

important repair jobs to contractors. As showing in what favor elsewhere this method is held, I found that out of fifty-eight cities, only five—viz, Buffalo, Erie, Philadelphia, Troy and Youngstown (Ohio)—let sewer repair work by contract. All the remainder of the cities reporting do all of this work by a regular force in the employ of the city cleaning and repair department.

Indeed, we do not need to go elsewhere to learn that the city can economically do this work. In May, 1899, a serious break occurred in the steep outlet portion of the Ontario street sewer. After a length of 66 feet, requiring almost no excavation, was rebuilt by contract at $14 per lineal foot, it became necessary to rebuild about 144 feet more of the sewer lying at a depth of about 20 feet. For this latter work the lowest bid was $22 per foot, or a total of $3,168. The bid was rejected and the work performed by the sewer department at a total cost of $1,960, or at $13.60 per foot, thus saving over $1,200.

If, therefore, our present method of flushing and repairing sewers be defective, what kind of an organization would be most efficient, and under what department should it operate?

As an aid in solving the latter question, I find, upon examining the data at hand pertaining to other cities, that the maintenance of sewers is either under the street cleaning or public works departments, under a specially organized sewer maintenance department, or directly under the chief engineer.

An examination of the cases falling under each of these four headings, to discover if possible under which method the best results are obtainable, reveals interesting results.

Of the sixty-one cities considered, I find twelve where sewer maintenance is under the street department, twelve where the report shows it to be directly under a public works department, twenty under the sewer department and seventeen under the city engineer.

In the first and third classes we find the cities of the first rank in importance and population, the two other classes representing cities of medium size.

The cities in each class were graded "good," "fair" or "bad," depending upon the general results obtained, judging by the information received. Those rated "good" are the cities where regular inspection and flushing is carried on, and where the sewers at all times are kept in a sanitary condition. Under "fair" are included those cities having less regular and frequent flushing and inspection, and where apparently some of the sewers at times are not in good order. The term "bad" is applied to those cities where there is no regular inspection; where the cleaning is carried out only upon the stoppage of the sewer, or where complaint is made of back flooding or other sewer troubles. The result shows:

	Good.	Fair.	Bad.
Street Department	1	5	6
Public Works Department..	1	4	7
Sewer Department	9	10	1
City Engineer....	6	7	4

By this comparison two things are clearly brought out,—viz, first, the inefficient maintenance when the care of the sewers is under a street cleaning department, where the attention primarily is given to keeping the surfaces of the street in proper condition, and, second, the compartively good result as obtained when sewer maintenance is under a sewer department, in which the care of sewers is the one business in hand. The cities under the city engineer show good results, because in those cases the work is usually divided between sub-departments, each with regular assigned duties.

The sewer department is usually a subdivision of the public works or of the city engineer's department, it being rather immaterial for our purpose by which of these departments the work is done, because either is a definite organization created for definite work, and may reasonably be supposed to perform efficiently its own special duties. Since with us engineering is a subdivision of the public works department, the obvious lesson from the above observations is that the work of cleaning and repairing sewers should be a subdivision under the chief engineer. Coming, then, to a statement of what would appear to be an efficient organization, we may mention:

First. The entire matter of maintaining our sewerage system should be under the general direction of the chief engineer.

Second. Directly in charge of the work there should be a competent civil engineer, whose training and experience fit him for this special work.

Third. The city should be divided into several districts, for the purpose of securing more complete and thorough work.

The outlines of these districts for the most part would follow the lines of division between the different drainage systems, but several outlet main sewers with their laterals might be embraced in one district.

The boundaries of these areas could easily be modified at any time should such modification be found to simplify the work of inspection and repair.

Fourth. Each district should be under the care of a competent inspector, with such assistance as experience may show to be necessary. These inspectors need not be engineers, but intelligent workmen who are able to understand the work and who are able to direct the workmen engaged.

Fifth. Require frequent and regular inspection of all sewers and catch-basins. The frequency in some cases would be greater than in others, but it is safe to say that every sewer should be inspected and flushed, if necesary, as often as once a year, and most of the sewers much oftener. Some sewers which are known to cause special trouble and the upper portions of lateral branches should be given even more frequent attention. Otherwise, in general, the inspection and flushing should begin at the remote laterals and progress systematically downstream to the outlet.

Sixth. A sufficient number of flushing and repair gangs should be provided for each district, who report directly to the assistant engineer in general charge. This engineer assigns their daily duties in accordance with the reports received by him from the several inspectors.

Seventh. An adequate system of accounts should be kept, showing the cost of the work in each particular case, and a record kept where the cost is equitably apportioned among the several legal sewerage districts of the city. In order to do this work in a city of this size a competent clerk would be necesary.

Eighth. An adequate annual appropriation should be made by the city council for the maintenance of our sewers, and should be none the less because the results obtained are not apparent to the eye of the ordinary citizen. In a large degree the healthfulness of our city depends upon the faithfulness with which this work is done.

From a consideration of the facts shown in table I, and from the experience of other cities, it would appear that an annual appropriation of $50 per mile for flushing and cleaning sewers, in addition to the appropriation for repairs and the cleaning of catch-basins, would not be unreasonable for the purpose of keeping the sewers in a proper condition. The oppropriation of, say, $15,000, added to an average of $20,000 for repairs and the cleaning of catch-basins, or $35,000 for the entire city, is about 5 per cent. annually on the original cost of the work, as the cost of keeping the sewers clean and in repair. No other class of structures can be maintained at so small a percentage of their cost, and the people of an intelligent city ought not to object to so slight a tax in consideraion of the improved healthfulness of the city. "Gold that buys health can never be ill-spent."

THE PROFESSION OF CIVIL ENGINEERING.*

By John Findlay Wallace.

The profession of civil engineering, as we now know it, is a child of the nineteenth century. The conception of that child, however, occurred with the earliest dawn of human history. Among the earlier engineers we find mention of Tubal Cain, who followed the mechanical branch of his profession; Noah, who devoted his attention to ship-building; Joseph, who achieved great success in the construction of grain warehouses and irrigation works; the unknown Egyptian who conceived, designed and constructed the pyramids, and in whose honor for all we know, the celebrated figure of the Sphinx may have been erected; Moses, who devoted his energies and lifetime to the transportation of a nation from one section of the globe to another, also giving some attention to hydraulics; and Joshua, who followed a similar line of work and also utilized his engineering talents in the overthrow of Jericho by means of the theory of rhythmic oscillation.

The ancient engineering profession, by whatever name we may call it, probably achieved its highest distinction during the existence of the Roman empire, through the efforts of the legion of engineers whose names have sunk into oblivion, but the remnants of whose works remain until today. The profession, however, has only reached its present strength and vigor during recent years. It would be useless to attempt to name, in the short time at my disposal, the typical engineers of the closing century.

It has been said that the measure of civilization is the measure of success attained

*President's address to the American Society of Civil Engineers delivered at its annual meeting in London, England, July 2, 1900.

in the preservation of food products. It seems that the truer exponent of modern civilization is transportation; for, while the Hebrew wanderer in Egypt was able to preserve his food products for a period of seven years, and his co-workers preserved in their mummies grains of wheat, which, thousands of years afterward, were transported to the fertile fields of Oregon and have since germinated and yielded the famous mummy brand of wheat, for which that region is celebrated, neighboring tribes and nations starved, because the only means of transportation in those days consisted of caravans of camels by land, and the shallow vessels which navigated the Mediterranean without a compass.

No one agency has been a more potent factor in the advancement of civilization than improved transportation facilities, and the profession of civil engineering has been the force which has conceived, designed and executed the works and machinery which have furnished the world with these facilities. There is hardly a branch of the profession which does not touch on the principle of transportation. The construction of steamships, harbor and river improvements, docks and wharves, canals, water supply, sanitation, manufactories, the utilization and transmission of power —in fact, it is difficult to name a branch of the profession which does not, either directly or indirectly, bear on the subject of trasportation.

The great engineers of this century have been responsible and should receive credit for the conception, design and execution of these works, without which the Americas, Asia, Africa, Australia and the isles of the sea would still be among the uncivilized, unknown or inaccessible portions of the world. While it is true that modern civilization, as applied to these portions of the globe today, is only partial and imperfect, the veil of obscurity has been lifted, the door has been opened, and modern civilization, guided by the hand of the civil engineer, has only to step forward and take possession of the heritage of mankind.

It behooves us, however, as members of this most noble profession, to realize the responsibilities resting upon us and appreciate the magnitude of the labors before us, and to prepare ourselves for the task; and in doing this to carefully observe our past failures and shortcomings. We should realize that our future success depends upon our full knowledge and appreciation of our past errors. We should discover those qualities in which we are lacking, and endeavor to supply and supplement our deficiencies, in order that we may be better fitted to assist our profession in successfully following out its manifest destiny.

The pioneer engineers of the century were strong, ruggd characters, educated in the school of adversity, who lived close to nature's heart and were keen observers of natural phenomena. They possessed strong imaginations, daring originality, faith in their convictions. These pioneers were followed by a class of engineers who were the students of their predecessors, and who supplemented their own talents and advantages by a study of the methods and the fund of knowledge accumulated by those who lived before them. This latter class has been followed by a generation of engineers who have had the benefit of the larger fund of accumulated engineering wisdom and experience, supplemented by academic and technical education; until now, the young man choosing the engineering profession has before him opportunities easily accessible, of acquiring the highest scientific and technical education, and entire libraries devoted to the description and elucidation of engineering works and methods, from which to gain an accurate knowledge of the great works which have been accomplished by other members of the profession in all countries, and from which he can derive material for the formation of his own plans. From this vast storehouse of accumulated facts, easily accessible throughout the world, he should be able to steer clear of the errors and avoid the failures of older engineers, and should be able to achieve a higher measure of success.

It has generally been understood that mathematical ability of a high order is a fundamental requisite to success in the engineering profession. This is not necessarily true, as it frequently happens that the person in whom mathematical ability of the highest order exists, is deficient in other essential qualities. While the successful engineer should be a good mathematician, should be a man of integrity, industry and resources, there are other qualities which cannot be ignored. The engineer who constructs a bridge, no matter how carefully he may design and construct his masonry foundations and steel superstructure, would not be considered an engineer, in the true sense of the term, should he neglect the hidden vein of quicksand, which might eventually cause the destruction of the entire bridge.

Among the underlying qualities necessary to the highest success in our profession are

the ability to accurately observe natural phenomena; a faculty of mentally picturing things in their proper relation to each other, good business judgment and sense; a careful study of business methods; tact, which to some men means so much and to others so little; personal loyalty, not only to the enterprise in which he is engaged, but also to his immediate superior; and above all, the engineer should not neglect the fact that "the proper study of mankind is man."

In the technical schools of the present day much time is spent in considering the strength of materials, the applied mathematics in the investigation of forces; but nothing in relation to the mental and moral constitution of man, which is the live material that engineers must use in fitting nature's raw products to the work in hand. There is too much of a tendency among engineers today, as ever, to consider the profession entirely a materialistic one, and to confine the education of the young engineer to a knowledge of materials and their uses, to the exclusion of the mental and spiritual.

The prevailing law of matter is inertia. The prevailing principle of the engineering profession is life. The application and direction of the life principle to matter, in order to overcome its inertia, change its form and adapt it to our needs, is the problem. Neither factor can be ignored, above all, the life principle. There is too much of a disposition on the part of our profession to value too highly what are the tools of our trade; to forget for a moment that they are simply tools, and fail to appreciate the energizing factor and the mental make-up of the engineer.

It is not the most expert bookkeeper who becomes the most successful banker or merchant, no matter how important carefully kept accounts may be to the success of a bank or mercantile business. It is not the surgeon who has the finest set of instruments, or even the greatest knowledge of their uses, who is necessarily the most successful. It is not the lawyer who has read the most law, but the one who can discriminate and apply his knowledge to the case in hand, who is the best jurist. So it is not the engineer who is the most expert mathematician, the finest draftsman, or who may design and calculate the most beautiful structure, who is the most successful.

The true engineer of today is the one who, seeing a necessity arising in the onward march of civilization, can think out its solution, conceive a project, design the necessary works connected therewith, and carry out the scheme as a whole to a successful issue, at the same time convincing his fellowmen of the necessity for the work, the efficiency and economy of his design, and his own ability to accomplish the desired result.

The surplus labor of the past is the capital of today. The conservation and preservation of that capital is a necessary factor in promoting modern civilization.

Our works should increase the comforts of mankind, "cause two blades of grass to grow where one grew before," enable persons and property to be carried greater distances in shorter periods of time, with increased comfort and convenience and at the least possible expense. The economy of labor should be the ultimate object to be attained.

The best engineer is not necessarily the one who will design and construct an elaborate bridge across a mighty river, but the one who will design and construct such bridge so as to give the greatest amount of facility for transporation over it at the least possible expense. I have in mind a bridge over a great stream in America which, with its auxiliaries, was constructed some years ago at an expense approximating ten million dollars. It brought a national reputation to its engineers. I have in mind another bridge, located within five miles of the same structure, which, so far as railroad traffic is concerned, performs the same functions but cost one-tenth the amount of money. The construction of this latter bridge was a mere incident in the career of the engineers who designed and superintended the work, and it has brought practically no addition to their fame.

In comparing the work of engineers, that engineer is the best who designs and constructs, results being equal, in such a way that the interest on capital invested, together with maintenance charges and operating expenses, are a minimum. It is certainly poor engineering to construct works so massive and with such a surplus of strength and solidity that the interest on the original amount invested far exceeds the cost of repairs, renewals and interest on a differently designed work which would perform a similar service.

In this I think the engineers of the old world can learn from those of the new. On the other hand, in the construction of works of a permanent nature, so as to reduce the cost of operation, maintenance or renewal, the new world can certainly learn from the

old. During the past century, however, the problems which have confronted the engineers of the old and new worlds have been vastly different. Works have been constructed in the old world to meet existing and stable conditions; in the new world works have been provided to create conditions; consequently, it has been necessary for engineers in the new world to have not only vivid and correct imaginations, and to be able to judge of possibilities and future requirements, but to design and construct their works in such a way as to bring about the desired results with a limited amount of labor and capital.

It has not been a question of choice between what was best or even most economical; the main question has been one of what it was possible to do under the circumstances. Frequently, it was a case of the engineer creating the circumstances. Conditions, however, are rapidly changing, and the engineer of the new world is following closely in the footsteps of the old world engineer, and his works are gradually becoming more substantial and permanent.

While it is not only desirable, but necessary, that the independent units of our profession, in the form of the individual engineer, should reach the highest state of efficiency, it is also necessary for the highest success that these units be combined. The closing century has witnessed gigantic combinations in the financial and industrial interests of the world. In the engineering profession, the engineers of the British empire have organized the Institution of Civil Engineers and made it the leading engineering organization of the civilized world. The last half of the century has seen the birth and vigorous growth of our own organization, the American Society of Civil Engineers. Engineering organizations in France, Germany and other countries have also brought engineers together and tended to advance the standard of our profession.

In America numerous local organizations have been perfected at secondary centers of population, which have done much to furnish engineers within their environment with the encouragement and strength due to associate with their fellows. These different organizations all have their functions. They are, however, restricted in their influence, and while engineers may and should be benefited by a connection therewith, they should not forget that the American Society of Civil Engineers construes the term "Civil Engineer" in its broadest sense, and embraces all specialties and subdivisions of the engineering profession. While a connection with local or special organization may benefit the individual engineer, the greater measure of benefit to the profession at large can be derived from affiliation with the more representative national body. It is through the national organization that we must expect to secure proper recognition for our profession.

Engineers in America do not appreciate the importance of this subject as fully as they should, or as much as their English brethren do, but they are becoming rapidly educated in this direction. As an instance of this, several years ago an engineer was sent to Australia in the interest of an American bridge company. He asked for a hearing before a certain commission which had charge of an important piece of engineering work. The first question asked was, whether he was a member of the institution of civil engineers of Great Britain. He replied that he was not. He was then asked if he was a member of the American Society of Civil Engineers. He gave a like answer, after which there fell upon the conference a silence that impressed him with the fact that he would have no standing as an engineer in that country unless he was connected with one or the other of these great bodies. He immediately cabled his principals that it would be impossible for any representative of their company to succeed in that quarter of the globe as an engineer unless he was affiliated with one of the national organizations.

I cite this instance in order to impress not only upon the members of the society, but upon American engineers generally, the importance of the fact that these organizations have a higher standing in the eyes of the lay public than they sometimes have in the eyes of the individual engineers.

The point I desire to make and emphasize is the importance and responsibility of the engineering profession in relation to the advancement of civilization, and the fact that it is our duty, first, to fit ourselves as individuals in every possible way for the responsibility placed upon us, and, secondly, that we should combine individual units in organization; that it is the duty of the engineer first to fit himself for his individual work, and next to combine with his fellow engineers for the strengthening and elevating of the profesion.

From time to time much has been said in relation to engineering ethics, and sug-

gestions have even been made that they be formulated. We should not forget that engineering ethics are simply business ethics, and that the foundation of all ethics is the golden rule, which we should individually endeavor to observe and practice.

CURRENT INFORMATION.

Meeting of the American Society of Municipal Improvements.

The seventh annual meeting of the American Society of Municipal Improvements will be held in Milwaukee Aug. 28, 29, 30 and 31. As the previous meetings of this organization have brought together men of the best experience and the most widely recognized capability in the management of the practical affairs of municipalities, and as their discussions have been valuable contributions to the knowledge of such work, it is expected that this meeting will be one of much importance. The president of the society, Mr. A. D. Thompson, has devoted much time during the past year to strengthening the organization, and in this work he has had the assistance of prominent officials in the different sections of the country. The following is a list of the cities now having membership in the society:

Albany, N. Y.	Louisville, Ky.
Allegheny, Pa.	Mansfield, O.
Akron, O.	Marietta, O.
Atchinson, Kan.	Memphis, Tenn.
Bangor, Me.	Milwaukee, Wis.
Binghamton, N. Y.	Minneapolis, Minn.
Birmingham, Ala.	Nashua, N. H.
Blomington, Ill.	Nashville, Tenn.
Bridgeport, Conn.	Newark, N. J.
Brooklyn, N. Y.	New Bedford, Mass.
Buffalo, N. Y.	New Haven, Conn.
Burlington, Ia.	Newport, Ky.
Calgary, Can.	New York, N. Y.
Camden, N. J.	Omaha, Neb.
Champaign, Ill.	Oswego, N. Y.
Chicago, Ill.	Ottawa, Can.
Chillicothe, O.	Parkersburg, W. Va.
Cincinnati, O.	Peoria, Ill.
Cleveland, O.	Plainfield, N. J.
Concord, N. H.	Portland, Me.
Covington, Ky.	Quebec, Can.
Davenport, Ia.	Quincy, Ill.
Dayton, O.	Richmond, Ind.
Dubuque, Ia.	Rochester, N. Y.
Dupont, Ga.	Saginaw, Mich.
Eau Claire, Wis.	St. Louis, Mo.
Ft. Wayne, Ind.	St. John's, N. F.
Grand Rapids, Mich.	St. Paul, Minn.
Guelph, Can.	Sheboygan, Wis.
Halifax, N. S.	South Bend, Ind.
Hamilton, O.	Syracuse, N. Y.
Hamilton, Ont.	Toledo, O.
Harrisburg, Pa.	Toronto, Can.
Indianapolis, Ind.	Urbana, Ill.
Jersey City, N. J.	Washington, D. C.
Kalamazoo, Mich.	Washington C. H., O
Lafayette, Ind.	Williamsport, Pa.
Lima, O.	Wilmington, Del.
Lockport, N. Y.	Youngstown, O.
Los Angeles, Cal.	Zanesville, O.

President Thompson has also given much attention to the work of interesting members in preparing for a profitable discussion on the various branches of municipal work and expects the Milwaukee meeting to be in this respect of much importance to officials who are seeking information. The arrangement of the program will not be completed for two or three weeks, though it has been under consideration for some time. The meetings will be held in the arcade of the Plankinton Hotel. Other hotels which are recommended by the local committee are the Pfister, St. Charles, Schlitz, Blatz, and Republican, the prices of which range from $2 a day upward.

The chairman of the local committee on arrangements is Mr. George H. Benzenberg, who has been prominent in the society since its organization and was its second president. The secretary is Mr. Bush, secretary of the Milwaukee Board of Public Works. Mr. Benzenberg has been in Europe for several months, and, having just returned, the completion of arrangements has been delayed somewhat by his absence, but the assurance is given that nothing will be lacking in the entertainment. Milwaukee has a reputation for generous hospitality and the fact that Mr. Benzenberg is at the head of the committee on arrangements is sufficient assurance to the society.

Mr. Benzenberg advised Municipal Engineering, under date of July 25, that his committee, at a meeting the day before, had determined upon the general entertainment features. Seven sessions of the society for the transaction of business have been provided for. The reading of the reports of the various standing and special committees, together with papers, will occupy most of these sessions, allowing ample time for the discussion. Entertainments have been provided for the visitors, properly interspersed between the sessions, embracing:

(1.) A street-car ride for the ladies about the city, including a trip to the National Soldiers' Home, where an open-air concert will be given.

(2.) Outdoor entertainment for all visitors.

(3.) A carriage ride through the city, including visits to the City Hall, pumping stations, Lake Shore and West parks, the

beautiful library and museum building and some one of the breweries of the city.

(5.) A visit by the ladies to the Layton Art Gallery.

(5.) A visit by special train to the E. P. Allis works and to the Milwaukee Cement Works.

(6) A boat ride on Lake Michigan and a banquet.

Mr. Benzenberg says "The local committee extends a hearty invitation to the municipal officials of all American cities to visit Milwaukee during this convention as members and delegates of this society and assures them a royal welcome. The final arrangement of sessions and above entertainment features will be determined short

A. D. THOMPSON, C. E.,
President American Society of Municipal Improvements.

ly before the meeting, as the papers and reports will not be received until about that time."

Among the important features of the meeting will be the reports from the various standing committees submitting the results of special investigations during the year. Mr. R. E. McMath, of St. Louis, will present a report on the subject "City Government and Legislation." Other committees which promise reports, or apapers, are those on street paving, sewerage and sanitation, taxation and assessment, disposition of garbage, street cleaning, review, municipal datta, park development and maintenance. Mr. M. N. Baker will, in response to a personal request from the president, present a paper on "Uniform Accounting in National Municipal Statistics," and Mr. George T. Bouton, secretary of the Street and Water commission, of Jersey City, N J., will give an address on "Municipal Sewer Systems and Assessments for Same."

President Thompson furnishes the following outline of the program as the best that can be prepared at this time, and other features will be added later:

FIRST DAY—Tuesday, Aug. 28, 1900:

10 a. m. Meeting of the Executive Committee.

10 a. m. Meeting of the Finance Committee.

10 a. m. to 12 m. Delegates will report at the arcade of the Plankinton House for registration, badges, credentials, etc.

—Afternoon Session, 2 p. m.—

Opening of the convention Arcade-Plankinton House.

Address of welcome on behalf of the city of Milwaukee by his honor, Mayor

Response by the president.

Regular order of business:

1. Roll call.
2. Reading of minutes of last meeting.
3. Consideration of application for membership.
4. President's address.
5. Report of the secretary.
6. Report of the treasurer.
7. Report of the finance committee.
8. Report of the executive committee.
9. Report of special committees.
10. Selection of the Committees on Nomination of Officers and next place of meeting.

The ladies of the party will be entertained

by a trolley ride over the city during the afternoon.

—Evening Session, 8 p. m.—

"Report of Committee on Municipal Data," by the chairman of the committee, C. C. Brown, consulting engineer, Bloomington, Ill.

"Report of Special Committee on Municipal Statistics," by the chairman of the committee, August Herrmann, President Board of Water Trustees, Cincinnati, O.

"Uniform Accounting and National Municipal Statistics," by M. N. Baker, Associate Editor Engineering News, New York, N. Y.

SECOND DAY—Wednesday, Aug. 29, 1900:

—Morning Session, 9:30 a. m.

"Report of the Committee on Street Paving," by the chairman of the committee, George W. Tillson, Principal Assistant Engineer, Department of Highways, Borough of Brooklyn, N. Y.

"Standard Construction of Asphalt Pavements."

"Standard Construction of Granite Block Pavements."

"Standard Construction of Medina Stone Block Pavements."

"Standard Construction of Brick Pavements."

The ladies of the party will enjoy a visit to the Layton Art Gallery during the time of this session.

—Afternoon—

The afternoon will be occupied by a carriage ride to view points of interest and the public improvements in the city of Milwaukee.

—Evening Session, 8 p. m.—

"Wood Pavements in Chicago," by ——

"Wood Pavements in Indianapolis," by ——

"Methods of Conducting Cement Tests in Pavement Construction," by ——

"Tests of Asphalt," by ——

Election of officers.

Selection of next place of meeting.

THIRD DAY—Thursday, Aug. 30, 1900:

—Morning Session, 9:30 a. m.—

"Report of the Committee on Disposition of Garbage and Street Cleaning," by the Chairman of the Committee, John Jones, Street Commissioner, Toronto, Ontario.

"Papers on Garbage Collection and Disposal."

N. P. LEWIS, C. E.,
Ex-President of American Society of Municipal Improvements.

"Report of the Committee on Sewerage and Sanitation," by the Chairman of the Committee, W. K. Eldridge, City Engineer, Lafayette, Ind.

Papers on "Sewerage and Sanitation."

—Afternoon—

The afternoon will be devoted to a visit to the pump factory of the E. P. Allis company, thence by special train to the works of the Milwaukee Cement company.

—Evening Session, 8 p. m.—

"Report of the Committee on Taxation and Assessments," by the Chairman of the Committee, August Herrmann, President Board of Water Trustees, Cincinnati, O.

"Municipal Sewerage Systems and Assessments, for same," by George T. Bouton,

Secretary Street and Water Commissioners, Jersey City, N. J.

"Report of the Committee on City Government and Legislation," by the Chairman of the Committee, Robert E. McMath, President Board of Public Works, St. Louis, Mo.

"Report of the Committee on Municipal

GEORGE H. BENZENBERG,
Ex-President A. S. M. I., and Chairman of Milwaukee Committee of Arrangements.

Franchises," by the Chairman of the Committee, Andrew Rosewater, Consulting Engineer, Omaha, Neb.

FOURTH DAY—Friday, Aug. 31, 1900:

—Morning Session, 9:30 a. m.

"Report of the Committee on Review," by the Chairman of the Committee, George M. Ames, Consulting Engineer, Grand Rapids, Mich.

"Report of the Committee on Electric Street Lighting," by the Chairman of the Committee, F. W. Cappelen, Consulting Engineer, Minneapolis, Minn.

Papers on "Electric Street Lighting."

—Afternoon Session, 8 p. m.—

"Report of Committee on Water Works and Water Supply," by the Chairman of the Committee, G. H. Bezenberg, Consulting Engineer, Milwaukee, Wis.

"Papers on Water Works and Water Supply."

"Report of the Committee on Park Development and Maintenance," by the Chairman of the Committee, Prof. A. N. Talbot, Professor of Municipal and Sanitary Engineering, University of Illinois, Champaign, Ill.

Papers on "Park Development and Maintenance."

Miscellaneous business.

Installation of officers.

Mr. Thompson's idea is not to attempt a meeting on the morning of the first day, but to devote the time to executive and finance committee meetings, registering of members, etc., and to hold the first regular session in the afternoon. No meeting will be held on the evening of the last day, as there remains in the four days only a possibility of ten sessions. The entertainment program, as outlined, consumes five sessions. At least seven or eight sessions will be required to transact the necessary business, and it is therefore evident that it will be imperative to reduce the entertainment feature somewhat. It is President Thompson's opinion that the entertainment feature should supplement rather than encroach upon the time required for the serious business of the meeting. It is especially gratifying that the local committee has provided unusually well for the entertainment of ladies.

The officers and standing committees of the society are as follows:

President—A. D. Thompson, Peoria, Ill.

First Vice-President—R. E. McMath, St. Louis, Mo.

Second Vice-President—Bernard Saunders, Toronto, Ont.

Third Vive-President—Dr. W. C. Woodward, Washington, D. C.

Secretary—D. L. Fulton, Allegheny, Pa.

Treasurer—F. J. O'Brien, Oswego, N. Y.

Finance Committee—W. B. Howe, Concord, N. H.; Geo. M. Ames, Grand Rapids, Mich.; W. S. Cook, New Bedford, Mass.

Street Paving—Geo. W. Tillson, Brooklyn, N. Y.

Electric Street Lighting—F. W. Cappelen, Minneapolis, Minn., chairman.

Sewerage and Sanitation—W. K. Eldridge, Lafayette, Ind., chairman.

Water Works and Water Supply—Geo. H. Benzenberg, Milwaukee, Wis., chairman.

AUG. HERRMANN,
Ex-President A. S. M. I., and Chairman Committee on Taxation and Assessment.

Taxation and Assessment—Aug. Herrmann, Cincinnati, O., chairman.

City Government and Legislation—R. E. McMath, St. Louis, Mo., chairman.

Disposition of Garbage and Street Cleaning—John Jones, Toronto, Ont., chairman.

Municipal Franchises—Andrew Rosewater, Omaha, Neb., chairman.

Review—Geo. M. Ames, Grand Rapids, Mich., chairman.

Municipal Data—Chas. Carroll Brown, Bloomington, Ill., chairman.

Park Development and Maintenance—A. N. Talbot, Champaign, Ill., chairman.

Under a resolution adopted by the last

annual meeting in Toronto, a small pamphlet has been issued giving a brief review of the history of the organization, its objects and some of the results accomplished, as follows:

"The desirability of an association of city officers for united and systematic consideration of the affairs controlled by and relating to municipal corporations has been the source of much favorable theoretical discussion, but numerous difficulties have appeared to prevent the practical application of the theory until the question was taken in hand in the summer of 1894, by Mr. M. J. Murphy, at that time Street Commmissioner of St. Louis, Mo. The persistent efforts and extended correspondence by this gentleman, assisted by the officials of Cincinnati and Buffalo, resulted in a call for a meeting of interested cities on September 19, 1894, at Buffalo, N. Y., for the purpose of affecting an organization of the officials representing both the legislative and executive branches of urban administration.

D. L. FULTON,
Secretary A. S. M. I.

"The general interest in such matters was indicated by the large representation of cities at this initial meeting. About sixty delegates from the following sixteen cities were in attendance and assisted in perfecting a permanent organization:

Allegheny, Pa.	Memphis, Tenn.
Buffalo, N. Y.	Milwaukee, Wis.
Camden, N. J.	Newark, N. J.
Cincinnati, O.	New Bedford, Mass.
Ft. Wayne, Ind.	New Haven, Conn.
Grand Rapids Mich.	Omaha, Neb.
Indianapolis, Ind.	Portland, Me.
St. Louis, Mo.	Syracuse, N. Y.

"The result of this meeting was the formation of the American Society of Municipal Improvements, the first practical association of any magnitude in America ever perfected for the consideration of city affairs. The agitation of leading municipal problems by the public press for two or three years immediately prior to the meeting at Buffalo had awakened public interest in city affairs and developed a general conviction of the necessity for united effort in devising improved and business-like methods in the conduct of affairs common to all. The movement, therefore, was launched at a most propitious time, as it met the full approval of the general public, and the stimulus imparted by such favorable conditions placed the society upon a sound and thriving basis, from which has developed a steady, healthy growth in numbers and usefulness.

"The society was organized on board lines and its field of operations embraces every department of a municipality with particular attention to taxation, government, sanitation, lighting and public improvements. It binds together for a common purpose the executive heads of the various departments together with the mayors and councilmen, who are responsible for the general policy to be pursued.

"It is the aim of the association to bring these officers together during the fall of each year, for the purpose of considering through papers, discussions and committee reports, all questions relating to the best interests of American cities, to promote social and friendly intercourse at such conventions and to circulate the information thus obtained among its members through the publication of the proceedings in pamphlet form. By these means the society endeavors to secure a thorough study of municipal affairs, the dissemination of information relating to same, the promotion of official efficiency and an honest and capable administration of all city departments.

"The attention of the association has been devoted principally to a consideration of the most urgent practical questions, the settlement of which would produce the greatest immediate benefits to the various cities comprising the membership. The investigations conducted, data compiled and reports submitted have represented the most extended and systematic research by practical men of the highest talent and ability.

"There have been compiled and published in the proceedings tables giving the most complete and detailed information regarding electric lighting, methods of taxation and assessments and pavements of various kinds in cities of the United States and Canada. Various committees report each year the latest practices and data upon waterworks, paving, sewerage, garbage collection and disposal, street lighting, street cleaning, taxation, city government, legislation, franchises, parks and municipal data. Standard forms for municipal reports have been partially developed in the effort to secure uniform methods of city reports as a basis for comparing methods and costs of operation in different cities, while an earnest endeavor has been made to secure the co-operation of the general government in compiling information regarding city affairs.

"In addition to these direct results a general public interest in city matters has been created, each official in charge of a department has been impressed with the importance of his duties and has received a comprehensive understanding of the operations of all departments while the extensive publication of the reports, papers and discussions has acted as an educator to all officials and citizens. The objects sought and the earnest, honest work of the organization have secured the expression of high appreciation from the daily and technical press of the country.

"The society includes cities in both the United States and Canada.

"The regulations concerning membership

are not severe and are expressed in the following concise statements:

"1. Any municipality of America is eligible.

"2. Any officer, director or engineer who has charge or supervision over or who is employed as a consulting engineer on any public or municipal department work is eligible for membership.

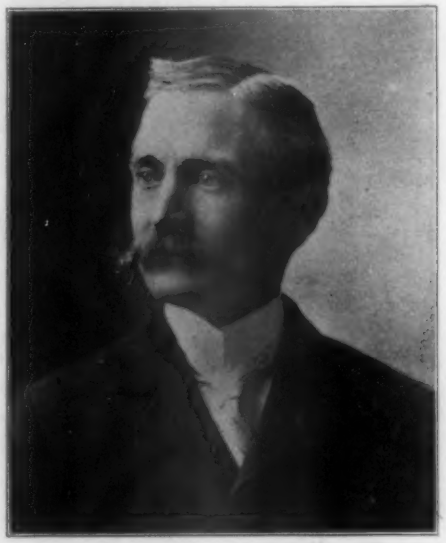
"An initiation fee of five dollars is collected from each city or other member in the second division. After a municipality has become a member any official of that city is also entitled to membership without the payment of an additional initiation fee. An annual fee of five dollars is collected from each person who becomes affiliated with the organization.

"The membership began in 1894 with a representation from sixteen cities, which number has increased steadily and rapidly, until at the present time eighty of the principal cities of the United States and Canada constitute the active membership. In other words, since the first meeting in 1894 the membership has increased 500 per cent.

"The benefits to individuals and cities through affiliation with this organization are well indicated in the enumeration of the results accomplished. These advantages increase in direct proportion to the number of cities interested and the extent of the country represented, and it is desired to include as active members every city in America interested in the betterment of the present municipal conditions.

"A general invitation is therefore extended such cities to become associated with this work, and interested officials are requested to direct the attention of the proper authorities to the organization and secure the authorization of a representation at the Milwaukee meeting. Delegates may be sent to the convention by any city and the stipulations for joining complied with at the place of meeting.

"Each year a meeting of the association is held in one of the principal cities to promote the interests of those municipal affairs which appear to require consideration. At these meetings the members are brought together for friendly intercourse and for the interchange of ideas by means of a carefully prepared program wherein experiences are recorded, difficult problems solved and new ideas promulgated. The questions which rise continually for investigation can seldom be settled satisfactorily by individual effort, but require the combined experience and extended research of an organized body. The results of the meetings are placed in permanent form by the publication of the proceedings in pamphlet form which includes the complete papers, discussions and minutes. These proceedings are distributed to the members free of charge for permanent reference.



GEORGE W. TILLSON, C. E.,
Chairman Committee on Street Paving A. S. M. I.

"A considerable benefit is derived also by the delegates through the opportunity to visit the cities selected as the places for meeting and examine the public works of same. These cities represent the most progressive elements of municipal practices and government and much can be learned by a personal investigation of their methods."

Exceptionally favorable railroad rates have been secured for the meeting on account of the National Encampment of the Grand Army of the Republic, which will be held in Chicago during the last week in August. The Western Passenger Association, which embraces the territory west

of Chicago, has secured a one fare rate for the round trip to Chicago with a minimum rate of $4 and with a one and one-third rate for the round trip from points where the regular rate one way is $3 or less. Tickets from points 200 miles from Chicago can be extended to leave Chicago up to and including September 30 by deposit of ticket with the joint agent at Chicago at any time from August 27 to September 2 upon payment of a fee of 50 cents; otherwise the return limit expires September 1. It is expected that these rates will be met and possibly bettered by the association controlling the remainder of the territory in the United States.

W. K. ELDRIDGE, C. E.,
Chairman of Committee on Sewerage and Sanitation A. S. M. I.

Sanitary Investigations of Illinois Rivers.

Advance notes have been furnished Municipal Engineering by Dr. J. A. Egan, secretary of the Illinois State Board of Health, on the sanitary investigations of the Illinois river and its tributaries with special reference to the effect of the sewage of Chicago on the Des Plaines and Illinois rivers prior to and after the opening of the Chicago drainage canal. Dr. Egan, in speaking of the apprehension in the minds of the people of the Illinois valley that the turning of the sewage of Chicago into the Des Plaines and Illinois rivers would be a constant menace to the health of the inhabitants of the borders of the rivers, mentioned the fact that for a considerable period over four-fifths of the sewage of Chicago has been carried by the river, with but small dilution of water. Obviously, therefore, the danger, if existing, cannot but be diminished from the entire sewage of the city diluted by a flow of from 300,000 to 600,000 cu. ft. of water per minute Speaking of the possible danger to inhabitants of St. Louis, he cites the fact that sanitarians as a rule agree that disease germs found in water rarely, if ever, increase in number, even if the water be polluted, and that they finally die. As the bacillus of typhoid fever exists at best but a few days, disappearing as a rule within one week, and under the most favorable circumstances surviving not longer than three weeks, it would seem that the fears of the people of St. Louis, over 350 miles from the recognized principal source of infection, are unfounded. It is believed, however, that some menace exists to the people of Chicago in their water supply from Lake Michigan. The experiments conducted by the United States Navigation Bureau in 1893-4, in order to determine the actual drainage of the great lakes, indicated that there is a rapid whirl at the south end with a strong current passing north along the east shore, while along the west shore the current flows south. The disposition of the currents, while favoring the water supply at Milwaukee, has a tendency, it is believed, to cause Chicago to receive in its

water supply the contaminated water of Milwaukee. Efforts to demonstrate the facts, however, could not be attended with success unless the sewage of every municipality lying between Milwaukee and Chicago were diverted from Lake Michigan.

Dr. John H. Long has made chemical and bacteriological examinations of the waters of the Illinois river for the State Board of Health, samples for this purpose having been taken from many points along the river. The results of the analyses are shown in full. These analyses show far less of organic matter than it would be supposed the water contains. The degree of rapidity of the transmission of organic matter depends wholly on the activity of certain bacterial ferments. Attempts have not yet been made to try this kind of fermentation on a large scale, but it is far from being impossible and it is to be hoped the purification of streams may yet be accomplished by the addition at the right time and place of the right kind of pure bacterial cultures. In connection with the other investigations Mr. Jacob A. Harmon has submitted a report of a sanitary survey of the Illinois river basin, which will be useful as a basis for further investigations.

Causes of the Grand Rapids Reservoir Accident.

The failure of the 6,000,000 gallon distributing reservoir at Grand Rapids, Mich., July 2, is generally believed to have been due to pumping it full to overflowing. The break occurred in the south side of the basin through which the only outlet pipe, a 20-inch cast iron main, was carried. This pipe was so undermined that two sections of it were broken and driven deep into the sand upon which the reservoir was built. The clay puddle at this point, which formed the core of the embankment, was washed out. When the water had escaped a break was found which was 110 feet wide at the top of the embankment, 25 feet at the middle elevation, and 15 feet at the lowest point, and leaving 4 feet of water remaining. The water flowing over the reservoir, reduced the cobble stone lining set in 2 feet concrete, which was broken away in much smaller sections than the earth embankment and puddle core. The reservoir is situated upon the top of some sand hills, at an elevation of 150 feet at the normal flow line, above the pumping station, and about one-half mile to the northwest on the Grand river, from which the water supply is taken. The reservoir has been in use 25 years, and while the earth of which it is constructed is unsuitable to this class of work owing to its sturdy nature, no serious leak or overflow had occurred until about two weeks before this accident when a break in a force main caused a washout. While the investigations made do not as yet ascribe the probable cause of the disaster, one fact is fixed upon, and that is that more water was pumped into the reservoir on the night of the break than the basin was intended to hold. During the 25 years it has been in use the rule has been that the depth of water must not exceed 21 feet, and now the dark line running from 20 to 21 feet can be discerned on the banks of the reservoir. The records of the water works office show that during the term of office of the present superintendent, it has gone as high as 22 feet and the residents in the neighborhood of the reservoir assert that for a week the average was almost 21 feet or within a foot of the top, and that it ran over several times.

The engineer who was on duty at the time of the break is said to have been discharged by the water board, this action being based upon an affidavit by a man who claimed that he visited the pumping station at 9 p. m. the night of the accident, and found the engineer drunk. The break was first seen by a newsboy at 4:45 a. m., who warned the people in the vicinity. Houses were swept down the hillside to the east of the reservoir, streets washed out and other damage done. One life was lost as an indirect result of the accident, but timely warning averted further fatality.

Rights of Competing Electric Lighting Companies.

Argument was heard by Judge Theard, July 12, in the case of the Edison Electric company for an injunction to restrain the Merchants' Light and Power company, Ltd., from using the poles of the Edison company on two streets in New Orleans, La. The suit involved the constitutionality of city ordinances which require electric companies to use the same poles and thereby contribute to the safety of the citizens and prevent the disfigurment of the streets. The Merchants' Electric Light and Power company asked the Edison company for permission to use its poles on two streets. Permission was refused and application was made to the city electrician, who, acting under the ordinances, designated the poles on which the Merchants' company might string its wires. The Edison company asked for an injunction. In answer the Merchants' company claimed

that the Edison company is without right and power to stand in judgment, for the reason that it is not lawfully in the exercise of any franchise of the city of New Orleans, having forfeited all right and privilege by disposing of its franchise and by consolidating with another company. Also, that the ordinances were reasonable exercise of the police power by the city council, and that the Edison company had consented to the ordinances and acquiesced in such regulations, and were acting under the same by using poles in common with other companies on other streets. The case was taken under advisement.

Proposed Mountain Springs Water Supply for St. Louis.

A project is being perfected by Chicago promoters to insure a permanent pure water supply to St. Louis, Mo. The plan is to tap the Merimac Springs, about seventy miles from St. Louis, at the base of the Ozark mountains, and pipe the water to St. Louis. One of the Merimac Springs has a flow of 98,000,000 gallons of water a day, and with the other spring in the vicinity, it is believed the daily capacity will be 200,000,000 gallons per day. James G. Cozzens, a real estate dealer, and E. M. Pratt, attorney, of Chicago, and Patrick H. Flynn of New York, are said to be the prime movers in the project. A construction company will be formed and application made to the St. Louis municipal bodies for a franchise

Assessment Laws Urged by Chicago Real Estate People.

A series of amendments to the special assessment law will be prepared and urged by the Chicago Real Estate Board, and an effort will be made to prevail upon the legislature to make the change. Robert C. Givens, E. A. Halsey and S. S. Greeley compose the committee on special assessments. The committee believes that the proposed amendment should contain the following changes:

The passage of a wheel tax ordinance by the city council, the proceeds of which should be used for street repairs.

An extension of the period allowed for the payment of special assessments from five to ten years.

The city to pay a portion of the cost of all street improvements, the amount of the city's share of the expense to be levied between 25 and 50 per cent. of the fair cash value of the property affected.

The amount of special assessments to be levied annually should be limited to 5 per cent of the fair cash value of the property affected.

Revenue from the extension of street railroad franchises to be used for permanent street improvements.

Proposed Licensing of Electrical Engineers.

At the next Indiana general assembly two bills will be presented by order of the Richmond city council. The bills will provide for the examination and licensing of electrical engineers, and empowering cities to turn the management of municipal plants over to a non-partisan board of trustees.

La Cross Brick Paving Ordinance Upheld.

The brick paving ordinance adopted by the city council of La Crosse, Wis., is held valid in a decision handed down by Judge Siebecker, July 11. The case in which the ruling was made was that of the state of Wisconsin, ex rel W. J. Boycott vs. mayor, aldermen and city clerk of the city of La Crosse, in which numerous defects in the proceedings for the proposed brick paving are alleged. The principal objection raised was that the city had adopted the portion advantageous to it and left out a clause providing for the awarding of damages to such property owners in case of change of grade. The mode of computing such damages is given, however, in the portion adopted. Judge Siebecker decided that although the portion awarding damages was not specifically adopted, still there is a provision for computing such damages and awarding them to the property owners, the measure as a whole by implication providing for such an award and it should be held as legally adopting that portion of the general charter laws and substantially complying with all provisions. The case will be appealed.

School and Civil Corporations Are Legally Separate.

The Indiana supreme court has decided that the bonds issued by the Indianapolis school board in 1890, to pay for the construction of school houses, and the bonds issued in 1900 to refund the former, are valid obligations and the payment of them cannot be enjoined. The court holds that the law under which the board of school commissioners of Indianapolis was elected is not special legislation, and that the school city and the civic city are separate corporations, each having the power to incur indebtedness up to the constitutional limit of 2 per cent.

The decision was rendered in the cose of

E. M. Campbell et al. vs. the city of Indianapolis et al, and was brought by Campbell, Wild & Co. to enjoin the Indianapolis school board from issuing $100,000 bonds and making a payment of six months interest on them. The principal question of law involved was as to the power of the school board as an independent corporation to borrow money irrespective of the constitional limitation on the power of the city to borrow. The superir court held that the bonds were valid and denied the application for an injunction, and the supreme court affirms this ruling.

Electric Treatment of Garbage.

The erection of an establishment in Ottawa, Canada, for the manufacture of electric plants to treat garbage and sawdust so as to get all the commercial products from them, is proposed. An experimental plant for the treatment of sawdust was erected in Ottawa some time ago by Prof. V. L. Emerson, which proved successful. A feature of the machines is to take sawdust and garbage, dry it in a machine, then have it treated so as to extract the heavy oils and alcohol, and continue the process until the purest results are obtained. It is stated that ordinary city garbage can be treated so as to secure products worth $8 and $9 per ton of the garbage.

Improvement Assessment Laws Upheld.

The Indiana Supreme court rendered a decision July 10 holding that the street improvement provisions of the Indianapolis city charter are constitutional. The decision was rendered in the case of William Holt vs. the City of Indianapolis and others, and reverses the recent judgment of Judge Allen, of the circuit court, who held that the Indianapolis city charter was open to objections that did not apply to the Barrett law which governs in making street improvements in smaller cities and towns. The supreme court decision was concurred in by Judges Dowling, Jordan and Monks, with Judges Hadley and Baker dissenting and reserving the right to file dissenting opinions setting forth their reasons for dissent.

In rendering its decision the court cites that the validity of the statute relating to the improvement of streets in small cities in Indiana, having a population of 100,000 or more, is assailed on the ground that it violates the provisions of articles 5 and 14 of the federal constitution, and section 21 of the bill of rights of the constitution of the state of Indiana, by authorizing the taking of private property for public use without due process of law, and without just compensation therefor. The court holds that there is ample opportunity for remonstrance in cases where the cost of an improvement is greater than the benefits derived; that this question of special benefits is a proper one for the board of works to consider, and that the board is not necessarily bound to the front-foot method of assessment. It may look to some other source of paying for the improvement outside of assessing the property-owners.

It is generally conceded that this decision will also establish the constitutionality of the city charters of Evansville, Fort Wayne and Terre Haute. The effect of the decision in Indianapolis will be that street improvement work will be resumed.

Entitled to the Full Flow of the Stream.

A decision was rendered by Judge Oster, of the superior court, San Bernardino, Cal., July 5, in the case of E. L. Mayberry vs. the Alhambra Addition Water company, which has been in litigation since 1887. Mayberry claimed the right to the full flow of the waters in Mill creek on Friday and Saturday of each week. The defendant conceded the right so far as the amount of flow that existed at the time the contract was entered upon, but contended that Mayberry had no right to the increased flow, which had been developed at great expense since the contract was made. Judge Oster held that under a contract made in 1860 by his predecessor, Mayberry is entitled to divert and use on Friday and Saturday of each week the developed as well as the natural waters of the creek, or, at least, so much as may be needed for the irrigation of the 154 acres of land upon which the original contract was based.

Power of Municipal Officials Over Street Paving Strongly Upheld in Minnesota.

The supreme court of Minnesota handed down a decision in the Cedar-st. asphalt paving case at St. Paul, Minn. Property-owners on Cedar-st. resisted payment of the repaving assessment on the ground that the cost was excessive, and that the method of making the assessment was wrong; that certain property had not been assessed, and that it was wrong to assess the property-owners for the paving of cross

streets. The district court decided in favor of the city, and the decision is sustained by the supreme court, which recommits the case to the lower court to enter judgment against the property-owners.

The court says: "In view of the finding and judgment and the rule established in a number of cases in this court as to the conclusiveness of the same, it is held that the assessment was made arbitrarily upon a front foot basis and without regard to benefits is without foundation, and it is held, further, that the conclusive character of this finding and judgment is not affected or overturned by the mere fact that in making the assessment the board ignored the fact that the improvement did not include the paving of street intersections on the south half of the same, but did include such cost as to all intersections on the north half, or, in other words, by the mere fact that intersections first mentioned were, for some unexplained reason, not paved under this contract, while those last mentioned were paved. The presumption is that the board of works has exercised its proper judgment in levying an assessment for any particular local improvement, and, until something appears in the record itself which amounts to and demonstrates a mistake of fact and of an affirmative nature, by way of evidence to the contrary, the action of the board is final and conclusive, except in case of fraud, or when it appears that an illegal principle or erroneous rule of law has been applied. It was admitted at the trial that the street railway company occupied the street with a single track for a distance of about 300 feet, and that no deduction on the assessment had been made on account thereof. The supreme court held that to make the point available it was, at least, essential for the objectors to show that the company, when obtaining the right to use the street, had agreed to pave that part over which it actually ran its cars. While agreeing that it would be improper for the city to collect in advance a fund for repair and maintenance of a pavement, to be used at some indefinite time under the guise of paying for its first cost, the court construes the provision of the contract relative to repairs to be nothing more than a guaranty of the quality of the workmanship and material. Regarding the point that the street had already been paved once, the court holds that, unless restrained by the charter, the power to make an improvement and assess abutting property is not exhausted when an improvement is made. It is a contributing power and may be exerted whenever necessary by reason of the destruction or inutility of the original improvement.

Not Responsible for Failure of Rain.

The Louisiana supreme court has rendered a decision in the case of Landers et al. against the Garland canal company, in which the water supply of the corporation was so reduced, owing to a small rainfall, that the people it supplied with water suffered much injury. The court held that "a canal company, having contracted to furnish rice farmers a sufficient supply of water to irrigate their lands during the planting season, cannot be held liable for damages which resulted from an insufficient supply, if the same is attributable to the inadequacy of the fall of rain, from which source its canal was to be supplied. In such case the rice farmers are not responsible to the canal company for rent, inasmuch as the shortage of water caused them nearly a total loss of their crop; and the intervention of the act of God, which released the latter from liability, should not be so construed as to inflict punishment on the former."

Investigation of Massachusetts Water Board.

The legislative investigating committee appointed several months ago to investigate the Metropolitan water board of Massachusetts for alleged violations of the labor and liquor laws and spending the public money extravagantly, finds that the contractors violated the spirit and letter of the laws occasionally, but new legislation is necessary to enable them to do business in any other way. The committee reports that the board has attended strictly to business in a business-like way.

A Serious Error in Publishing Paving Ordinances.

An error has been discovered in the printing of the alley paving and repaving ordinance at Detroit, Mich., which invalidates the assessments for this work as far back as 1897. In printing the advertisement for the paving ordinance after it was passed two lines were dropped out. These two lines concluded section 2 of the enactment, and specified the assessment district to be levied upon for the work done—the abutting property. The ordinance, as published, provided no assessment district. The city council has been advised to reenact and republish the ordinance with the defect rectified at once.

The Experimental Filtration Plant at Philadelphia.

The experimental filtration plant at Philadelphia, Pa., is ready for operation. The plant was erected under the personal direction of Mayor Ashbridge, Director of Public Works Haddock, Chief Webster of the survey bureau and Chief Hand of the water bureau. The laboratory is located at the Spring Garden pumping station, at Thirty-third-st. and Grand ave. It consists of two sedimentation basins, two slow sand

filters, nine tanks for mechanical filters and a laboratory. Morris Knowles is the engineer in charge of the plant. William George Toplis will conduct the bacteriological work, and Professor George H. Thomas, Ph. D., the chemical analysis.

A Decision on Stream Pollution in Pennsylvania.

The Pennsylvania supreme court handed down a decision July 11, defining the right of the public to uncontaminated streams. Dr. George P. Yost, the defendant, was indicted and acquitted in the quarter sessions court of York county, for maintaining a cesspool at Glen Rock, and refusing to obey the order of the state board of health to abate it, the commonwealth alleging that the pool infected the water from which the York water company drew its supply for the citizens of York. The case was appealed to the superior court, where the judgment was reversed, the verdict set aside and the record recommitted to the lower court for a new trial. It was then carried to the supreme court, which reversed the judgment of the superior court. Judge Brown said: "If the public, having a right to take from this stream pure and unpolluted water, found in it the germs of disease coming from the cesspool of the defendant, which he maintained on a tributary of the stream, his offense would be a public one, for which he would be properly indicted. The wrong would be against the whole community as a community, not simply against an individual or certain individuals, however numerous, and ought to be punished as a crime. If the public have a right to receive pure water through the agency of a corporation legally authorized to take it from a stream, he who pollutes it offends against the public."

The distinction between this privilege of the public, exercised through the right of eminent domain, and the standing of a private corporation as a riparian owner, is emphasized by Judge Brown, who says:

"The rights of the York Water company were, under the evidence produced, simply those of an ordinary riparian owner, having no ownership in the running water and no right to divert or sell the same for general use, whether pure or impure. As an individual, it could complain of the alleged pollution of the water, and it alone, for which there was a civil remedy. Before the defendant could be convicted of any offense against the public, it was the duty of the commonwealth to show that he had offended against rights of the public. No such offense was proven; no right of the public to use the water pumped by the York Water company was shown. Any wrong committed was a private one, for which the remedy was purely civil."

The court continues as follows:

"The defendant was acquitted by the jury after having been directed by the court to pass upon the question of his guilt. They should have been told to acquit him.

"We feel that we cannot concur with the superior court in its view as to the power and authority of the secretary of the state board of health. The statute authorizes the board to act, and the learned trial judge in the court below correctly held that there could be no conviction on two counts because nothing had been shown except some action by the secretary. Without formal action by the board, directing a nuisance, or the cause of any special disease, or mortality to be abated and removed, its secretary can neither speak nor act for it in ordering the abatement or removal of the nuisance, and the disregard of the order is not indictable."

Fuel Gas Cannot Be Sold for Lighting.

A decision has been rendered by Judge Toney of the Jefferson circuit court, Jefferson, Ky., in the suit of the Louisville Gas company against the Kentucky Heating and Lighting company of Louisville. The defendant company's only claim to do business in the distribution of gas in Louisville is based on the chartered right to distribute natural gas for heating purposes only. The company asserts, however, that it is not responsible for what its patrons did with the gas it furished them. If they used the gas for illuminating purposes, through the agency of a Welsbach burner or other converting medium, the company was not responsible for such conversion. The plaintiff's counsel held that the defendant was not empowered, either in the letter or the spirit of its charter, to do other than supply natural gas for heating purposes only. This contention is sustained by the court in every main point. Judge Toney says: "It results from the foregoing views that the plaintiff's petition, in so far as it seeks to enjoin the defendant from selling and distributing natural gas, or a compound of natural and artificial gas called fuel gas, for illuminating purposes, by the use of the Welsbach burner or other mechanism must be granted, and also the prayer of the petitioner to restrain the defendant from casting a cloud upon the plaintiff's title to the exclusive right of supplying illuminating gas in the city of Louisville for illuminating and heating purposes must be and is granted." The case will be appealed.

Report on Street Pavement in Many Cities.

The official committee sent to leading cities by San Antonio, Tex., composed of E. G. Trueheart, city engineer; R. F. Alexander, chairman public improvement committee; R. G. Scott, street commissioner, and Marshall Hicks, mayor, has submitted a report of the information gathered on the subject of street paving. After setting forth in detail the points regarded as most important the committee says:

"To briefly summarize our impressions we will say that for very heavy traffic the granite or stone pavement is certainly the best. This kind of pavement is very noisy and rough, and probably the most expensive, but the former objections can be minimized by making a close-fitting joint and filling it with cement grout, and for a heavy traffic street like Market we believe it to be the best.

"Good streets can be made of asphalt, if care is taken in their construction; they are the smoothest and easiest to clean and also very easy to repair, but we would recommend no asphalt without the ten year guarantee for maintenance.

"For moderately heavy traffic there is no question that vitrified brick makes a fine pavement; we would prefer the paving block to the ordinary size brick and would use nothing but a cement filler, and have at least one expansion joint on each side of the street next to the curb, running longitudinally with the street. We believe that the creosoted pine block makes a first-class pavement in every respect and we would be heartily in favor of giving it a trial on some of our streets. Whatever pavement is adopted we believe the ten-year guarantee ought to go with it.

"An indispensible requisite of any pavement is a good foundation, and in order to get this we believe that a concrete foundation is necessary in our city. We would most emphatically insist on a grooved rail and on a concrete foundation under the ties of the street railway, except where a natural rock foundation is encountered. We believe that it is of the utmost importance that no pavement should be attempted until all the water connections be made with lead pipe and all sewer and gas connections be made up to the curb; and we further believe that it is essential to have a uniform and first-class curb the entire length of each street; to omit it would be to ruin the appearance of the whole street. In our opinion no street should be paved unless new curbing be laid with it; better to curtail the number of streets to be paved and what we do pave to pave it right. Good curbing is just as necessary for a well-paved street as the wearing surface itself; in our opinion, have both or have none.

"One word about our mesquite block pavement in conclusion. Considering the length of time that this pavement has been down, ten years, and considering the further fact that practically no repairs have ever been made, and also that the pavement has been torn up a score of times, we believe that its condition is equal, if not superior, to any pavement we saw under similar conditions. No pavement on earth can remain in good order without occasional repairs, and we believe that our mesquite block has stood it about as long as any of the best pavements in the country.

"We believe an improvement could be made in the manner of laying the mesquite block, and that is by laying square blocks with close fitting joints and providing for expansion. Only one serious objection would remain and that is its being slippery; but this could be reduced to a minimum if the street would be kept perfectly clean and sprinkled but seldom.

"We have said nothing about prices in this report, because prices vary in every city, and therefore would be of no special value to us; but we can say in a general way that granite and Medina stone pavements are the most expensive; brick and asphalt, except in the brick centers, cost about the same, and the common wooden block, the cheapest, except macadam. The creosoted block in Indianapolis cost from $2.15 to $2.60 per square yard, including a six-inch concrete base. We found that the materials used in the construction of pavements in the cities we visited are far cheaper than they can be had in our city, with the single exception of rock asphalt, which, of course, would be cheaper here. Therefore, it would be but natural that our pavement would cost us more than it does the northern cities."

In setting forth their observations on asphalt pavements the committee say that they were careful to compare natural rock asphalt pavements with one on Avenue C in San Antonio, laid with Uvalde asphalt, obtained from their deposits near San Antonio. They found no pavements exactly like this, but the nearest approach to it was the Neuchatel asphalt pavement of Buffalo, and they say: "We are thoroughly satisfied after seeing all the asphalt streets we inspected, which were many miles, that the material with which Avenue C, Trevino and Commerce streets in San Antonio are paved, viz., Uvaldo rock asphalt, is equal if not superior to any of them."

Minneapolis Sewer Assessment Laws Invalid.

A decision has been rendered by Judge Pond, of Minneapolis, in the case of State of Minnesota vs. John Pilsbury, involving the payment of special assessments for a sewer. The question raised was the same as in the Norwood-Baker case of Ohio and the ruling was in line with the decision of the supreme court in that case. This ruling in effect holds that the sewer assessment laws of Minneapolis arbitrarily enforce assessments without reference to benefits.

Meeting of American Society of Civil Engineers.

The thirty-second annual convention of the American Society of Civil Engineers was held in London, July 2 to 5, at the house of the Institution of Civil Engineers. In his address of welcome Sir Douglas Fox, president of the establishment of the Institution of Civil Engineers, referred to the establishment of the society in 1818 under the first president, Thomas Telford, as the beginning of a profession of engineering in Great Britain; to the identification of the institution with the development of engineering; and to the scope of the institution, which, with its 6,000 members, embraces all lines of engineering except the military. The welcoming speech was replied to briefly by John F. Wallace and H. S. Haines, on behalf of the American Society of Civil Engineers, and by Jesse M. Smith for the American Society of Mechanical Engineers. Among the papers and subjects for discussion were the following: "High Buildings and Restrictions on Their Height," C. T. Purdy; "Rail Manufacture," R. W. Hunt; "The Filtration of Water," Rudolph Hering.

The annual business meeting of the society was opened with the announcement of the results of the informal letter ballot for members of the nominating committee which was decided upon this year, by reason of the very small number of members likely to be present at the annual convention, to take the place of the usual complicated system of holding separate caucuses of the members present from each geographical district. In District No. 1, Nelson P. Lewis, of Brooklyn, was nominated and elected; district No. 2, F. K. Stearns; No. 3, E. B. Guthrie, of Buffalo; district No. 4, Prof. Edgar Marburg; district No. 5, C. L. Strobe, of Chicago; district No. 6, Edward Flad, of St. Louis; district No. 7, O. J. Tollock, of Leavenworth, Kas.

The result of the annual informal ballot for the time and place of holding the next annual convention was as follows: Buffalo, 40; Chicago, 10; remainder badly scattered. As to time 82 favored June and 44 July.

The proposed amendment to Article VII, Sec. 2, of the constitution was considered, which effects a radical change in the manner of selecting the nominating committee and making nominations. It was voted to submit it to letter ballot.

In the discussion of the subject of water filtration, which was adjourned Tuesday and resumed Thursday, an English engineer was asked to present his views on the subject. He said that while by far the largest development of filtration works has taken place in Europe, the old world is really indebted to America for much of its knowledge on the subject of filtration. The experiments of the Massachusetts State Board of Health, and the more recent ones at Louisville, Pittsburg and Cincinnati, furnish the most accurate data in existence on the subject. He said an interesting question is the part played by the sand layer in the filtration process, and that, in his opinion, the sand bed is little more than a strainer and support for the surface filter, and when the latter is in proper condition the sand is doing little or nothing. It is necessary, however, to have a considerable thickness for the sand layer to provide for cleaning. Also, if the surface of the filter is anywhere injured, the water that goes through unpurified will be much less with a thick sand layer than a thin one. He had found that there is considerable motion among the sand particles. The water does not pass vertically downward through the sand, but flows in fine filaments in every direction, and its velocity in the fine interstices between the sand grains is really considerable. With thin sand beds there is more movement of the sand and more tending to sorting the sand in coarser and finer layers. To avoid this it is best to use very fine and uniform sand. In the management of a filter, he said ignorant men too often resort to all sorts of expedients to make the water go through faster. To give a ready check on the condition of the filters and the character of the water passing, he has installed an automatic recording meter which registers graphically the rate of flow from each filter. Any injury to the film on any part of the filter beds or any irregularity in their working will be at once recorded on this meter, and the supervising authority can thus assure himself every day of the correct operation of the plant.

George W. Fuller gave a summary of the varying character of the waters of the United States for which filtration has to be provided, in which he stated that for the clear waters of the glacial region, sand filtration is doubtless the best process, especially where sewage-polluted streams are to be dwelt with. For waters from which vegetable stains must be removed or for the western and southern waters containing a large amount of suspended matter, a coagu-

lant is necessary, and where this is applied a mechanical filter gives better results than a slow filter. The trouble in using coagulant in connection with slow sand filters is that some of the coagulant is likely to pass from the settling basin to the filter and it clogs it up very rapidly, necessitating frequent cleaning. A mechanical filter, on the other hand, can be rapidly cleaned whenever necessity requires. In treating waters carrying large amounts of suspended matter or vegetable stain, constant changes are necessary in the dosing of coagulant to suit the varying condition of the water. With the mechanical filter it is possible to add a further amount of coagulant as the water leaves the settling basin and passes to the filter, in case clarification has not been completed in the settling basin. With the slow sand filter, however, this cannot be done, for the reason already stated. Concerning the rate of flow, some recent small experimental filters have given good results with a rate of 5,500,000 to 7,000,000 gallons per twenty-four hours; it is probable, however, that such rapid filtration could only be made successful with water not seriously polluted. As to covering filters, there has been a sort of rule that they need not be covered where the mean temperature of the coldest winter month is above 32 degrees Fahr.

Mr. Fuller believes, however, that in view of the occasional exceptionally cool winters that covering was advisable in almost every locality in the United States where slow sand filters would be installed. He said that no term yet suggested to designate the so-called rapid or mechanical filtration was entirely satisfactory. He objected to any other term which related to any one part of the process. It should be considered as a whole, and he proposed that it be called the American purification process. The frequently unsatisfactory results obtained with the larger plants thus far built on this system he ascribed to defects of design and management, and not to the system itself.

Dr. Riddell of London believed English engineers would do well to give the American filtration system a trial, and thought that for some waters it might prove superior to the slow sand system. He thought that filtration would eventually be supplemented by sterilization, and advised engineers to seek to develop some regenerative process by which heat could be applied to the sterilization of water at small cost.

Dr. Kemmler of Antwerp said that he wished to emphasize the fact that the important action of a sand filter is its biological action. He counseled simplification of the filters, and thought that for settling basins the system of alternate filling and emptying of the basins preferable in some respects to the continuous flow system. The rate of filtration should be varied with the condition of the filter and restrictions on waste should be put in force to reduce the volume of water to be filtered.

Walter Hunt thought the best proof of the efficiency of ordinary sand filters was the very low death rate and the small amount of water-borne disease in such cities as London. When these results are so satisfactory too much importance should not be attached to fine points of construction.

So satisfactory is the working of the filters that Dr. Thorpe, the chemist recently placed in charge of the London water supply, has abandoned the bacterial analyses, which have so long been kept up, and relies on chemical analyses alone to indicate the working of the filters.

In relation to the suggestion as to the sterilization of water he told of the scientist, who, at the British association meeting, reported that he had put his children on sterilized food and sterilized water. After a short time they began to droop and he had to put them back on ordinary diet.

Some of the results obtained with polarite filters were given by Andrew Johnson, who claimed that while polarite was much more expensive than sand, much more rapid filtration was possible with equally good bacterial results.

Among the many courtesies tendered the American engineers was the throwing open of Guild hall, an honor reserved, as a rule, for only the most distinguished guests of the city. One of the most enjoyable of all the entertainments given for the American engineers was an all-day excursion to Warwick castle and Stratford-on-Avon.

The Telephone in Electric Light Plants.

Mr. I. Woodard, in the Electrical Review gives the following suggestion for "chasing trouble" on arc or incandescent lines when not in operation: "In my station I have a telephone which is used between my residence and the station, which, by means of flexible cords, I connect to one or all of the

lines running out of the station. When I go out on the line to do any work, whether "chasing trouble" or not, I take along a magneto and a strong receiver, with which I can ring up my assistant at any time and from any place, by merely connecting to one line and to the ground through the instruments. I may say here, in regard to the ground connection, that I have found that merely shoving a screwdriver into the ground eight to twelve inches will generally suffice. This device saved me more than its cost in a few months in time and trouble. The whole rig need not cost more than $9, which would include a complete instrument in the station, magneto, transmitter and receiver, and a strong receiver to use on the line, the usual station testing magneto being used on the line. Telephones are so cheap nowadays, that with the experience I have had with my telephone I would not want to run any country plant with lines of over a mile in length without this simple outfit."

Garbage Disposal in China.

Some time ago the agricultural department became interested in the study of the disposal of garbage, sewerage, etc., in foreign cities, and solicited the aid of the state department in obtaining information. The department directed the consular officers of the United States to forward all information obtainable.

An uncanny tale comes from Consul Fowler that makes the reader feel creepy. He says:

"The cleanest cities in China are Hang-Chow and Ning-Pox. In the center of those two cities I have myself seen dogs eating bodies of babies; the rotting corpses of cholera cases; snakes slowly winding in and out; many dogs, slime, dead cats; in fact, the most horrible filth on one side, while across the way the glitter of gold, pomp and luxury; such are the principles of a Chinese street. The garbage collector is the beggar or the starving dog."

Consul Ragsdale writes from Tien Tsin that "all animal food is comparatively costly and the mass of the people are poor. The methods are from house-to-house collection. The work is done by private enterprise and the material deposited in vacant lots and in front of houses where the owners do not employ the collector. Tin cans are much prized by the natives and are a regular article of commerce. When beyond use as a bucket they are flattened out and made into anything from a candlestick to a bath tub—the latter being used only for foreigners. Broken glass is reheated and made into lamps and curios, snuff bottles, etc. All of this material is collected by private enterprise and the sorting is done in any place most convenient to the collector. Household waste waters are thrown into the empty pools at the side of the streets and eventually this water is used for street sprinkling. The streets and the passers-by are sprinkled by means of long-handled ladles.

"The street refuse collections are made by men and boys with a basket and a small, long-handled ladle or shovel. The basket hangs on the back from the left shoulder and great skill is shown by some collectors in scooping up everything and throwing it into the basket without loss. This material is taken to some bright, sunny and convenient locality, mixed with two parts of street dust and made into cakes, the size of an orange. These cakes are sun-dried and sold as fertilizers. The most convenient place for a foreigner to study the details of these methods is the stone bridge on Legation-st. It is only a few hundred yards from the two foreign hotels and the French, German, Japanese, English, Russian and American legations. The bridge, being thus centrally located with a wind-swept stone floor exposed to the sun, possesses all the requirements of a first-class fertilizer dryer. It is in daily use. The sewage system of Pekin is certainly a combined system. Everything combines in the streets. No filters are used. The supply of street sweeping exceeds the demand by about three inches in depth."

Society for the Promotion of Engineering Education.

The eighth annual meeting of the Society for the Promotion of Engineering Education was held at Columbia University, New York City, July 2 and 3. In the absence of Prof. Ira O. Baker of the University of Illinois, his address was read by Prof. J. M. White of the University of Illinois. The growth of engineering schools was reviewed in this paper, which included a number of statistical tables showing their present status. Other papers presented were: "Personality in Teaching," Prof. John P. Brooks of the State College of Kentucky; "Business Methods in Teaching Engineering," Prof. Arthur L. Rice of Pratt Institute; "Present Status and Tendencies of Engineering Education in America," Prof. Robert Fletcher of Dartmouth; "The Promotion of Engineering Education," Prof. William G. Raymond of Rensselaer Polytechnic Institute. A number of papers were read by title, among which were the following: "Original Investigation by Engineering Schools a Duty to the Public and to the Profession," Prof. A. Marston of Iowa State college; "The Relation of the Technical School and the Manufacturer," by Prof. Walter B. Snow, Jamaica Plain, Mass.; "Minor Consideration Affecting the Arrangement of a Course of Study in Civil Engineering," Prof. Henry S. Jacoby of Cornell University;

"The Development and Practice of Architecture," Prof. White.

Officers were elected as follows: President, Prof. Frank Marvin, Lawrence University, Lawrence, Kas.; secretary, Henry S. Jacoby, Cornell University, Ithaca, N. Y.; treasurer, C. A. Waldo, Purdue University, Lafayette, Ind.

Technical Meetings.

The American Public Health Association will hold its twenty-eighth annual meeting in Indianapolis Oct. 22 to 26. The chairman of the local committee on arrangements is W. H. Armstrong and the secretary is Dr. John N. Hurty.

The annual meeting of the National Association of Municipal Electricians will be held in Pittsburg, Pa., Sept. 25 to 27. J. W. Aydon, P. O. Box 373, Wilmington, Pa., Secy.

Personal Notes.

William H. Luster has been re-elected city surveyor at Elizabeth, N. J.

H. H. Pendleton has been reappointed city engineer at Independence, Mo.

The Hon. Henry H. Sprague has been appointed a member of the Metropolitan water board.

F. L. Bishop, C. E., St. Paul, Minn., died at Omaha, Neb., July 2, of an overdose of alcohol and morphine.

Charles L. Webber, surveyor of St. Claire Co., Ill., and ex-city engineer of East St. Louis, Ill., died in that city July 10.

H. C. Thompson, formerly city engineer at Sault Ste. Marie, Mich., has accepted a position with the Water Power company of that city.

Ernest McCullough has resigned his position as city engineer, street commissioner and building inspector of Lewiston, Idaho, in order to give more time to his private practice. He was succeeded as city engineer by Edson R. Briggs, county surveyor; as building inspector by W. A. Denny, city marshal; as street commissioner by Lafayette Harrington.

D. D. Clarke, M. Am. Soc. C. E., has been appointed chief engineer of water works at Portland, Ore., to succeed Col. Isaac W. Smith, deceased.

W. Goodman has been appointed chief engineer of the water works department at Kansas City, Mo., to succeed Wynkoop Kiersted, M. Am. Soc. C. E.

H. T. Cory, who has had charge of the engineering work at the University of Missouri for the last year, has been appointed Professor of Civil Engineering at the University of Cincinnati.

William T. Hunt, president of the New Jersey Sewerage commission, has returned from a three months' trip in Europe, where he studied sewage disposal methods.

Paul G. Brown, assistant city engineer in charge of the water tunnel construction at Chicago, Ill., has resigned that position to accept one with F. R. Dravo & Co., water works contractors of Pittsburg, Pa.

In the announcement of the award of prizes by Municipal Engineering Company for the best accountant forms and records for electric and gas lighting companies, published in the July number of Municipal Engineering, a typographical error occurred in the name of James R. Shurtz of the Trenton Gas and Electric company, Trenton, N. J. This is especially regrettable, because the forms submitted by Mr. Shurtz were, as stated in the announcement, of exceptional merit.

In the article on "Public Control of Rates," by Mr. George McLean, published in the July number of Municipal Engineering, a paragraph appeared reading "This right to regulate rates should be exercised when competition is present." Mr. McLean calls attention to this statement, in which there was an error, and says that correctly it should read "This right to regulate rates should never be exercised when competition is present." The error, as will be noted, entirely reverses the meaning of the statement made.

MACHINERY AND TRADE.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.

No. 649,114. May 8, 1900. Street Sweeper. W. H. Strutt, New York, N. Y., assignor of one-half interest to Alfred Reeves, same place. A hand machine having an endless belt brush driven from the main wheels. This brush is carried upon a belting frame which also carries a scoop or tray which co-operates with the brush and which may be lowered so as to scrape the surface of the street. The dirt is discharged into a receptacle to the rear of the endless brush.

No. 649,144. May 8, 1900. Paving Brick. Adolph C. Stich, Independence, Kas. Automatically disposed quarters of the brick are offset and the depressed surfaces are provided with spacing lugs of a less heighth than the depth of the depression. Successive bricks intermesh with the other and the spacing lugs determine the thickness of the mortar.

No. 649,363. May 8, 1900. Fireproof Plaster-Board. Patrick Ryan, New York, N. Y. This article is composed of successive layers

of paper and plaster, the paper being perforated so that the plaster may extend therethrough.

No. 649,409. May 8, 1900. Filter. Ira H. Jewell, Chicago, Ill. The device is too complicated for a short digest. Its principal features are the peculiar arrangement of the supporting bed for the granular layers of filters and the peculiar means for rapidly cleansing the filter.

No. 649,410, May 8, 1900. System for Controlling Operation of Filters. Ira H. Jewell, Chicago, Ill. An electrical device by the preceding inventor especially adapted to control the operation of the filter mentioned.

No. 649,643, May 15, 1900. Arch Bridge Daniel B. Luten, Lafayette, Indiana. The arch is formed of concrete, iron or steel and the abutments are tied together with ties extending therebetween below the water line of the structure.

652,399. June 26, 1900— Hand street sweeper. William H. H. Miller, Williamsport, Pa. A hand sweeper by which the major portion of the dirt is taken into a scraper while the finer dust is swept up by the revolving brush. The scraper is carried by a hinged hopper which may be swung up and back so as to discharge its load into the main receptacle.

652,535. June 26, 1900—Fire-proof building construction, Fred L. Douglas, New York, N. Y. Y-beams extending between the usual I-beams and have fire-proof slats hinged to the base flanges of the Y.

652,547. June 26, 1900—Street sprinkling machine, Rufus L. McDade and Patrick L. Kelly, Bureau Junction, Ill. The principal feature of this device is a series of diagonally disposed nozzles through which the water may be forced.

652,670. June 26, 1900—Apparatus for cremating garbage, George Duryea, Middle Hope, N. Y. The garbage is discharged into a revolubly inclined flue through which the smoke and hot gases of combustion are forced to a fan.

652,743. July 3, 1900—Tile floor construction, Charles F. Buente, Allegheny, Pa.

653,008, 653,009, 653,010, 653,011, 653,012. July 3, 1900—Apparatus for purifying water, Charles H. Koyl New York, N. Y. A process of, and a series of apparatus for, purifying water.

653,149. July 3, 1900.—Apparatus for sweeping and cleaning streets, Jeremiah A. Paige, Manchester, N. H. The dirt is delivered up by a rotating brush into scoops or buckets by one of the supporting wheels, said buckets discharging into the body of the vehicle.

653,477. July 10, 1900.—Street sweeper, Joseph C. Kane and Anthony J. List, Allegheny, Pa., assignors to the Improved Street Sweeper company, Pittsburg, Pa. Several improvements in details of construction in the machine of the transverse rotary type.

652,729. July 17, 1900—Gate for drawbridges, John P. Cowing, Cleveland, O. A rotary gate, which is swung across the roadway by the withdrawal of the draw.

653,737, 653,738, 653,739, 653,740, 653,741, 653,742, 653,743, 653,744, 653,745, 653,746. July 17, 1900—Apparatus for purifying water, Omar H. Jewell and William M. Jewell, Chicago, Ill. A series of patents relating to the method of and apparatus for purifying water and a method for making re-agents for purifying water, the late series being of considerable interest to those engaged in water supply.

653,759. July 17, 1900—Granular bed filter, Robert T. Weaver, New York.

650,805. July 17, 1900—Filtering material, Nicholas Jacobsohn, St. Petersburg, Russia, and a filter material consisting of charcoal, sand and magnesite of Portland cement.

653,909. July 17, 1900—Manhole cover, Thomas P. Greger, Philadelphia, Pa., assignor to Greger Manufacturing company, Camden, N. J. This cover consists of two portions, the outer one of which is adapted to receive a filling of the same material as the surrounding pavement.

654,043. July 17, 1900—Filter, John F. Ziegler, Toledo, O. A peculiar arrangement of pipes and filter shafts.

Street Sweeping Apparatus Manufacturers.

Joseph Lay & Co., Ridgeville, Ind., have recently equipped their street sweeping department with complete machinery for turning out hickory splints for street sweeping purposes. This machinery is of the most modern kind, and, with the facilities of the firm for obtaining the best second growth hickory stock, they think they are thoroughly equipped for turning out satisfactory work. They report that, contrary to expectations, there has been more work in the street sweeping departments this season than in the past, due somewhat to the demand from America's foreign possessions, which required, as a sanitary precaution, much work in this line. In a letter to Municipal Engineering they say: "Business in all lines of our departments has been exceptionally

good, and we see no reason at present why it should not continue to be so, for a great many of our customers are not shutting down as promptly for the summer season as they did. It would be safe to assume that their vacation periods will not be so long as they have been in past years."

What Develops Power.

The Dixon Crucible company, Jersey City, N. J., in a little practical dissertation on lubrication, says: "All men are wrong about something. A few men have found out that the coal they burn at one end of their plant, and the power they get at the other depends on the oil they use between; the rest treat oil as a trifle. A few men have also found out that the addition of 10 to 15 per cent. of Dixon's pure flake graphite to the oil or grease used will enable the oil or grease to do several times more work. Other men are finding this out more slowly. A few don't care a continental."

Trade Notes.

ASPHALT.

The People's Asphalt company, Wilmington, Del., has been incorporated to manufacture and deal in asphalt and cement.

A fire started in the refining room of the Standard Asphalt company, at 824 Gratiot-st., St. Louis, Mo., recently, and spread rapidly to several barrels of asphalt, which were stored in the building, causing a loss of $1,500.

The Uvalde Asphalt company is in the field for supplying asphalt for street paving. Their business announcement, to which is directed the attention of city engineers, municipal officials, contractors and others interested, appears on the first inside cover page of this n umber of Municipal Engineering.

BRICK.

The Mentzer Clayworking company, Kenton, O., has been incorporated by D. L. Mentzer.

The new plant of the Lookout Sewer Pipe works at Blowing Springs, Ga., began operations July 3.

The Mattoon Tile company, Mattoon, Ill., is equipping its plant for the manufacture of paving brick.

The Chicago Brick Machine company, Chicago, Ill., has been incorporated by John J. Moroney, A. M. Hopkins and Charles Woodward.

A cement brick has been patented for paving purposes by Edward Steelman, of Salem, N. J., who claims that it costs but a trifle more than the regular brick and will last four times as long.

The Galesburg Paving Brick company, Galesburg, Ill., has rebuilt the machine building and dryer which was destroyed by fire recently, and began operations July 9. Brick and iron have been used in rebuilding so that the building is as nearly fire-proof as it can be made. Considerable new machinery has been put in.

The Purington Paving Brick company, Galesburg, Ill., has been awarded a contract for furnishing 1,000,000 block brick for paving purposes at Marinette, Wis. The company has also secured contracts for 400,000 brick for the Monmouth county road and for 750,000 brick for Maryville, Mo.

CEMENT.

A cement and tile factory will be operated at Adrian, Mich., by Matthes Bros.

The question of building Portland cement works in Farwell, Mich., is being agitated.

The Howard Hydraulic Cement company, Cement, Ga., will double the capacity of its plant.

The South Bend Portland Cement company, South Bend, Ind., has been incorporated.

The St. Paul Cement company, St. Paul, Minn., has been incorporated by John P. Hubert, F. and Virginia Berchem.

The new cement plant of William E. Krause & Sons, near Martin's Creek, N. J., is now turning out 1,000 barrels of cement a day.

The plant of the Cumberland Hydraulic Cement company, Cumberland, Md., was destroyed by fire July 11, entailing a loss of $75,000.

The Bronson Portland Cement company, Bronson, Mich., which has been closed since October, 1899, for improvements, is in operation again.

Press reports of July 17 stated that the entire plant of the Syracuse Cement company at Syracuse, Ind., would be in operation within ninety days.

The corner-stone of the Newaygo Portland Cement company's plant, Newaygo, Mich., was laid June 28. Work on the buildings is being rapidly pushed forward.

A deposit has been found four miles from Meyerstown, Pa., which is believed to be valuable cement rock, and a large plant will be erected if it proves satisfactory.

The entire plant of the Birmingham Cement company at Ensley, Ala., was destroyed by fire July 10, entailing a loss of $100,000. The plant was built last winter.

The Alpena Portland Cement company, Alpena, Mich., has decided to substitute lime for marl in the manufacture of cement, which will necessitate the rearranging of its plant.

The Canon City Cement company, Canon City, Col., has been incorporated with B. G. Woodford, Trumann Blanchett, L. M. Chase, Conrad Myers and Jas. T. Lock as directors.

The extensive beds of marl lying along the banks and at the bottom of St. Joseph and St. Mary lakes, at Notre Dame, Ind., have been leased to a syndicate, which will manufacture the marl into cement at South Bend, Ind.

The city of Monroe, Mich., is reported as willing to erect factory buildings if the owners of the extensive marl deposits at that place will establish a cement mill. The land is owned by Walter Crawford and A. J. Potter of Detroit.

The American Cement company of Philadelphia was awarded the contract for furnishing all the cement to be used in build-

ing the New York rapid transit tunnel. The contract calls for 1,500,000 barrels of cement at a cost of abuot $3,000,000.

The Baltimore & Ohio Railroad company has sent out a requisition for 3,399 barrels of Portland cement for use in the construction of the grain elevators to be erected by the company in Chicago. Address E. H. Bankard, purchasing agent, Chicago.

The Three Rivers Cement company, Three Rivers, Mich., has been incorporated by C. M. Harris, president; W. J. Willits, vice-president; George E. Miller, secretary; E. B. Linsley, treasurer. A plant will be built on the shore of Pleasant Lake, three miles from Three Rivers.

A. J. Haws & Sons, brick and cement manufacturers of Johnstown, Pa., will not, according to press reports, build the proposed new plant in Johnstown at present as projected. W. H. Haws is chairman, Herbert Morris secretary, and Jas. P. Thomas treasurer of the company.

State Geologist Blatchley will visit the region of the Kankakee river, in the northern part of Indiana, to examine the valuable marl deposits which belong to the state. The geologist found recently a deposit of marl six feet in thickness and underlying 200 acres near North Judson, Starke county. At some of the points where he has discovered marl cement manufacturers are buying land with a view to establishing large plants.

LIGHTING.

Newly incorporated companies: Gibsonburg Electric Light company, Gibsonburg, N. Y.; Pulaski Electric Light company, Pulaski, N. Y.

Lawrence Stenger, a student in electricity at Parker, S. D., has invented a dynamo which was successfully tested in that city recently.

The Erner-Hopkins company has been incorporated at Columbus, O., to manufacture electrical supplies by J. A. Erner, W. A. Hopkins, F. R. Huntington, J. M. Clark and T. M. Livesay.

Experiments have been made at Terre Haute, Ind., for producing gas for the manufacture of glass, which has proven successful. It is claimed that the cost is less than half the cost of natural gas.

The Economic Light, Heat and Power company of Chicago, Ill., has been incorporated to distribute light, heat and power through subways and to operate refrigerating plants. E. C. Wetten, Louis Spahn and D. T. Campbell.

The Groton Electric Light and Power company, Cortland, N. Y., has been incorporated to manufacture and supply gas and electricity. The incorporators are: J. R. Swain, Sing Sing; R. P. Barry, jr., and J. M. Mitchell, New York City; H. M. Hanland, Brooklyn.

The Peekskill Lighting company, Peekskill, N. Y., has been incorporated to manufacture electricity and gas for light, heat and power purposes. The directors of the company are: Benjamin B. Nostrand, jr., Peekskill; H. Hobart Porter, jr., and Francis Blossom, New York City.

J. Holt Gates & Co., 15 Monadnock Bldg., Chicago, have been awarded the contract for a new electric light plant at Centerville, S. D. They will install a 60 K. W. Warren single phase alternator and switchboard and will use the Bernstein system of series incandescent lighting. They also have the contract for the new addition to the municipal electric light plant at Princeton, Ill., where a 100 K. W. Warren machine will be installed and the Bernstein system of series incandescent lighting will be used. It is the intention to run both arc and incandescent lights on this machine, as well as the small power factor in motors. They were also awarded the contract for the entire new municipal electric light plant at Newberry, Mich., consisting of a 60 K. W. direct connected, 7,200 alternations, Warren dynamo, direct connected to a 13x12 Erie Ball engine. This contract also includes a Bernstein series incandescent system for street lighting.

MISCELLANEOUS.

The purchase of a stone crusher is urged by the press at Butler, Mo.

The common council of York, Pa., has decided to purchase a steam road roller.

The Fox River Valley Sewer Pipe company has removed from Noonah to Oshkosh, Wis.

The Princess Plow company, Canton, O., made an assignment on July 10 to Homer Briggle.

The common council of Orange, N. J., is considering the proposed purchase of a steam roller.

The Jackson Fire Clay Sewer Pipe and Tile company, Jackson, Mich., has been closed down.

The purchase of a 5-ton steam roller is advocated by B. J. T. Jeup, city engineer at Indianapolis, Ind.

W. D. Dunning, Syracuse, N. Y., was awarded the contract for furnishing the bureau of engineering of Syracuse with 125 monument covers at $176.50.

The National Paving and Construction company of St. Louis, Mo., was incorporated June 26, by Philip W. Schneider, jr., Myron Markley and Louis H. Meyer.

The Illionois Bridge company, Chicago, Ill., has been incorporated to manufacture iron work and machinery by Z. R. Logan, Hadac Wilson and John H. Baker.

The plant of the Kearneysville Lime and Stone company, which was destroyed by fire at Kearneysville, W. Va., will be rebuilt, and boilers, engines and stone crushers will be purchased.

The Pittsburg Steel Construction company, Pittsburg, Pa., has been incorporated to manufacture and construct bridges, by H. M. Hooker, T. A. Wilson, J. C. Wolfran, W. L. Berger and H. O. Turner of Pittsburg.

A. S. Aloe company, 517 Olive-st., St. Louis, Mo., have issued a new book of 250 pages giving full information, together with illustrations and prices of their mathematical and engineering instruments and drawing materials.

The United States Sanitary and Utility Sewage disposal company, Newark, N. J., has been incorporated by Alexander Lutz, Greenwich, Conn.; Bernard R. Guion, 3410 Third-ave., New York City; James E. Welch, Danbury, Conn.; Edward Kenny, Newark. The principal office is at 800 Broad-st., Newark, with Edward Kenny in charge.

The city council of Columbia City, Ind., on July 25, granted a franchise to the

Columbia City Heat and Power company for twenty years to operate a heating and electric power system. Work must be be-begun at at once before the construction of street paving begins. Mr. L. E. Holderman, superintendent of the electric light department of Columbia City, has been requested by the common council to investigate plants in operation elsewhere and report as to rates, etc.

Mr. Linus W. Brown, 741 Carondelet-st., New Orleans, La., has printed a little booklet containing illustrations of drainage and harbor work done under his direction in the vicinity of the city of New Orleans, embracing the electric pumping station, central power station, deep excavations, showing the method of bracing New Orleans drainage work, conduit work, deep foundations, the construction of the St. Louis-st. canal, suction basin, mending the levee, river bank protection, harbor work and sugar factory construction.

The Pacific Flush Tank company of Chicago has issued a new pamphlet containing illustrations and descriptions of the various styles of their automatic siphons, together with copies of the World's Fair diploma and medal awarded them, specifications for the construction of flush tanks, price lists, table of rates of discharge and many testimonials showing the wide-spread use of their apparatus and the satisfaction they have given. The pamphlet contains also an open letter to engineers having in charge the designing and maintenance of sewer systems. Copies can be obtained from the Pacific Flush Tank Co., 84 La Salle-st., Chicago, Ill.

WATER.

The New York Filter Manufacturing company, New York City, was awarded a contract for a 1,500,000 gal. filter plant for the Sharon water works, Sharon, Pa.

The Water Condensing Company of America, New York City, has been incorporated to make and sell still condensers. The incorporators are C. H. Tibbetts, G. V. Hupperty, C. A. Stephens, M. S. Eustace and J. B. Stevens of New York City.

The John W. Taylor Manufacturing company, Mt. Holly, N. J., has been incorporated to manufacture and sell turbine and other water wheels. The incorporatore are W. H. Hurt and J. W. Taylor of Lynchburg, and H. G. C. Thornton of Cranford.

Newly incorporated water companies: Sangerville Water company, Portland, N. Y.; Beeville Water company, Beeville, Tex.; Clear Spring Water company, Pittston, Pa.; Capistrano Water company, Santa Ana, Cal.; Shaster Water company, San Francisco, Cal.; Smithfield Water company, Suffolk, Va.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Pittsburg, Pa.—The alleys in the East Liberty Stock Yards are being paved with brick for sanitary purposes.

La Crosse, Wis.—In the suit of T. B. Benton vs. the city of La Crosse, to annul the contract of R. C. Houston & Co., of Chicago, for brick paving, Judge Siebecker decided, July 17, that the contract is valid. The case will probably be carried to the supreme court.

Flushing, L. I., N. Y.—The business men of this city are endeavoring to secure good roads, and in addition to interesting the city officials in the proposed improvements, they have employed an engineer to make a careful examination of the highways and render an impartial report.

Parkersburg, W. Va.—An opinion has been submitted by C. D. Forrer, city attorney, in which he holds that this city has no right to charge the adjacent property-owners all or part of the cost of paving. An amendment to the city charter will be required before further work on street paving or sewerage can proceed.

Emlenton, Pa.—Mayor Miller and Solicitor Kahle are preparing to ask the legislature to repeal the present street paving law, which requires the property-owners to bear all of the expenses of paving. Mayor Miller favors the method adopted by cities of the third-class, under which the property-owners pay two-thirds and the city one-third of the amount.

Fargo, N. D.—The paving suit of Peter Picton against the city of Fargo was argued before Judge Pollock, of the district court, July 20. This is a test case, in which the plaintiff contends that the ordinance creating the second improvement district was not properly passed by the city council, and that the paving law of 1897 is unconstitutional. He contends, on these grounds, that the assessment against his property for the paving is not valid, and asks that it be set aside. Judge Pollock took the case under advisement.

Toledo, O.—City Engineer Brown will submit a resolution to council providing "that all brands of cement to be used in public improvements be tested by the city civil engineer with at least a 28 days' test, previous to March 1 of the season in which they are to be used, and the results reported to the street committee for approval; and that all cement to be used on any improvement be delivered on the work at least 30 days previous to its being used, and that the city civil engineer be immediately notified of the delivery and location of the same in order that a test be made as to the quality of the cement delivered."

Philadelphia, Pa.—The Alcatraz Asphalt Paving company is endeavoring to eliminate the dust, which is a source of annoyance to the property-owners in the vicinity, by having dust preventing appliances put in, and boxing up all chutes and elevators so that the fine stone dust will be confined to the building. The Richardson & Ross company will make the same provision. The confinement of the dust will, it is feared, prove injurious to the health of the employes, but the companies are making an

effort to comply with the ruling of the board of health. Meanwhile the property-owners are perfecting arrangements to ask the courts to compel the removal of the plants.

Buffalo, N. Y.—During the last month twelve ordinances have been passed requiring the Union Traction company to pave certain rights of way between its tracks. The ordinances provide that in case the company should refuse to do the work it was to be done under the supervision of the street department and the cost charged to the Union Traction company. The company has refused to carry out the terms of the contract and the matter has been referred to Corporation Counsel Walker to see if the company cannot be forced now to accept the terms of the ordinance.

Chicago, Ill.—Judge Carter sustained the objection to the proposed asphalt pavement in Indiana-ave., from Eighteenth to Thirty-ninth-st. Attempts have been made for more than two years to pave this street with asphalt or brick, and in January, 1900, an ordinance was passed for asphalt paving. The attorney for the objectors showed that the original ordinance for the pavement was presented to the city council May 20, 1899, was referred to the South Side streets and alleys committee, and is still in the hands of that body. The new ordinance for the improvement was passed without giving the property-owners a public hearing, as provided by a law. Judge Carter decided that the ordinance was invalid.

CONTRACTS TO BE LET.

Wapakoneta, O.—Bids are asked until Aug. 10 for graveling the Santa Fe pike. Samuel Craig, engr.

Cortland, N. Y.—Bids are asked until Aug. 1 for paving Groton-ave. with asphalt. Fred Hatch, cy. clk.

Canton, O.—Bids are asked until Aug. 4 for improving and paving a number of streets. Louis M. Ley, cy. clk.

Hamilton, O.—Bids will be received until Aug. 10 for brick and asphalt paving. M. O. Burns, cy. clk.

Council Bluffs, Ia.—Bids will be received Aug. 6 for paving a large number of sidewalks. Cy. Engr. Etnyre.

North Bergen, N. J.—Bids are asked until Aug. 2 for grading Liberty-st. and Pierce-ave. Emil J. Foerch, twp. clk.

Roanoke, Va.—Bids are asked until Aug. 1 for paving, grading and improving a number of streets. J. H. Wingate, cy. engr.

Upper Sandusky, O.—Sealed proposals will be received until Aug. 4 for grading and graveling a road. E. N. Halbedel, co. audt.

Paterson, N. J.—Sealed bids are asked until Aug. 6 for macadamizing Mt. Prospect-ave., in Aquackanock twp. Geo. M. Botbyl, co. clk.

Camden, N. J.—Bids are asked until Aug. 17 for repaving Kaighn-ave. with Belgian blocks. Chas. H. Ellis, jr., chrmn. com. on sts.

Greensburg, Ind.—Bids are asked until Aug. 6 for constructing free gravel roads in Jackson twp. Coleman T. Pleak, co. audt.

Wapakoneta, O.—Sealed bids are asked until Aug. 10 for grading, graveling and culverts in the Santa Fe pike. Samuel Craig, engr.

Ludington, Mich.—Sealed proposals will be received until Aug. 15 for constructing a 6-ft. cement walk. Emery D. Weimer, chrmn. com.

Kroskel, Minn.—Bids are asked until Aug. 1 for building 5 mls. of road. Town bd.

Gas City, Ind.—Sealed bids will be received Aug. 24 for building 2½ mls. of cement and brick sidewalks. Wm. P. Alexander, cy. clk.

Brazil, Ind.—Sealed bids are asked until Aug. 7 for paving W. Main-st. with vitrified brick on concrete foundation. Jos. W. Williams, cy. clk.

Van Wert, O.—Bids are asked until Aug. 4 for furnishing macadam and constructing a turnpike 2¾ mls. long in York twp. G. W. Sill, chrmn. road comrs.

Camden, N. J.—Sealed bids will be received until Aug. 7 for paving Kaighn-ave., from the ferry to Front-st., with Belgian block on concrete. St. com.

Indianapolis, Ind.—Sealed bids are asked until Aug. 1 for paving the sidewalks of Urbana-st., from New York to Owasso, with cement. Albert Sahm, chrmn. B. P. W.

Oshkosh, Wis.—Sealed bids are asked until Aug. 27 for paving Main-st., from the Main-st. bridge to Polk-st., with brick. Frank Monahan, chrmn. B. P. W.

Decorah, Ia.—Sealed bids are asked until August 1 for paving Water and Winnebago-sts. with vitrified brick. Geo. W. Adams, mayor; T. F. Auchmoody, cy. clk.

Bloomfield, Ind.—Bids will be received until Aug. 7 for building gravel and macadam roads in Wright twp., Greene county. Harvey L. Doney, co. audt.

Fowler, Ind.—Sealed bids are asked until Aug. 6 for the construction of sections 1, 2, 3 and 4 of the William B. Fowler and other free gravel roads. Jas. D. Smyth, co. audt.

Shoals, Ind.—Bids are asked until Sept. 3 for building about 15 2-3 mls. of gravel or macadam roads in Perry twp. Horatio Harryman, co. audt.; John K. Summerville, chrmn co. comrs.

Cincinnati, O.—Sealed proposals are asked until Aug. 13 for paving Bruce-ave., from Hamilton to Kirby, with asphalt. Robt. Allason, prest. Bd. Pub. Service; Geo. T. Holmes, clk.

Canton, O.—Bids are asked until Aug. 4 for 23,310 cu. yds. of excavating, 8,690 lin. ft. 6x20-in. curbing, 37,470 sq. ft. of sawed flagstone, 900 sq. yds. block paving. L. L. Ley, cy. engr.

Jacksonville, Fla.—Bids are asked until Aug. 9 for constructing about 5,858 sq. yds. of brick paving and 3,161 lin. ft. of stone curb on portions of five streets. Philip Prioleau, cy. engr.

Bayonne, N. J.—Sealed bids are asked until Aug. 7 for the improvement of W. Thirteenth-st., from Avenue C to Avenue D, and W. Fourteenth, from Avenue D to Hudson boulevard. W. C. Hamilton, cy. clk.

Georgetown, O.—The contract or contracts for improving 1st and 2nd sections of the Carlisle and Eagle creek road in Jackson twp. will be let at public outcry Aug. 8. Robert McCall, co. audt.

Middletown, O.—Sealed bids are asked until Aug. 6 for paving, as follows: Third-st., brick paving, 13,477 sq. yds.; asphalt block, 1,200 sq. yds.; new curbing, 3,997 lin. ft.; old curbing reset, 500 lin. ft.; S. Main-st., brick paving, 13,678 sq. yds.; new curb, 873 lin. ft.;

old curb reset, 1,652 lin. ft.; N. Main-st., brick paving, 5,488 sq. yds.; new curb, 21 lin ft.; old curb reset, 332 lin. ft. Frank Stevens, cy. clk.

Gallipolis, O.—Sealed bids will be received until Aug. 16 for paving with vitrified brick Locust, Third, Cedar and Second-sts.; certified check for $5,000. E. E. Bradbury, cy. clk.

Spokane, Wash.—Sealed bids will be received until Aug. 3 for paving Washington-st. with asphalt on cement concrete foundation, with granite curb, catch basins and manholes. Robert E. Clarke, secy. B. P. W.

Findlay, O.—Sealed proposals are asked until Aug. 16 for paving Locust-st. with paving block, together with grading, curbing, catchbasins, sewerage, drainage and cross walks. Frank C. Ray, cy. clk.

Washington, D. C.—Bids are asked until Aug. 4 for grading and regulating several suburban streets, and until Aug. 11 for about 10,000 cu. yds. of street grading. H. B. McFarland, chrmn. dist. comrs.

South Bend, Ind.—Sealed bids are asked until Aug. 13 for paving W. Jefferson and Paris-sts. with brick, and the sidewalks on both sides of Komble-ave. and the east side of Oliver-st. with cement. L. A. Hull, cy. clk.

Indianapolis, Ind.—Sealed bids are asked until Aug. 1 for constructing cement walks on Montcalm, Morris, Walcott and York-sts. and Ercokside and Indiana-aves., and for graveling Ringgold-ave. Albert Sahm, chrmn. B. P. W.

Chicago, Ill.—Sealed bids are asked until Aug. 14 for improving with cedar block pavement, resetting and renewing old curbstones and repairing and replastering curb walls on Thirty-ninth-st. L. E. McGann, comr. pub. wks.

Orange, N. J.—Sealed bids are asked until Aug. 6 for macadamizing, curbing, paving gutters and flagging or reflagging the sidewalks of Park-place, from Park-ave. to the East Orange line. Lawrence J. Donnelly chrmn. com. on sts.

Meyersdale, Pa.—Bids are asked until Aug. 3 for grading, curbing and paving a portion of Center-st.; also for taking up and relaying about 1,000 sq. yds. of paving on Meyers-ave., and building an arch over Mill race. W. H. Habel, secy. coun.

East Liverpool, O.—(Special)—Bids will be received until Aug. 1 for 7,700 sq. yds of brick paving on gravel foundation on Calcutta road and Kossuth-st.; 6,500 sq. yds. of macadam paving on Pennsylvania-ave.; 4,100 lin. ft. curbing. John A. George, cy. engr.

Toledo, O.—Sealed proposals are asked until Aug. 6 for paving with asphalt, asphalt blocks, brick or vitrified block, Washington, Michigan, Orange and Vance-sts. and Leland-ave. J. E. Connell, cy. clk. Sealed bids are asked until Aug. 2 for constructing a road. William M. Godfrey, co. audt.

San Antonio, Tex.—Sealed bids will be received until Sept. 3 for the construction of all or any part (not less than a whole street) of about 101,000 sq. yds. of street paving complete, with either asphalt surfacing, vitrified brick, granite or stone blocks, mesquite or creosoted pine blocks. Separate bids will be received for all or any part (not less than a whole part) for the surfacing only with the above materials. Separate bids for curbing will also be received. E. C. Truehart, cy. engr.; Marshall Hicks, Mayor; W. W. Johnson, cy. clk.

CONTEMPLATED WORK.

Iberville, Ia.—Street paving is contemplated.

Ripon, Wis.—Main-st. will be paved with brick.

Michigan City, Ind.—Brick paving is contemplated for Market-st.

St. Augustine, Fla.—Brick paving is proposed for San Marco-ave.

Mexico, Mo.—Brick paving is contemplated for Washington-st.

Warrensburg, Mo.—Paving is contemplated for Holden-st. Mayor Wilson.

Saco, Me.—Bids will be asked soon for macadamizing Main-st. St. com.

Wichita, Kas.—The question of macadamizing Waco-ave. is being agitated.

Kansas City, Mo.—Ordinances were passed July 23 to pave a number of streets.

Ottawa, Ill.—This city contemplates expending $7,000 for street improvements.

Ft. Dodge, Ia.—The city council has decided to pave Central and First-aves.

Morris, Ill.—The city council has appropriated $1,000 to macadamize Liberty-st.

Kearney, N. J.—The street committee has been authorized to improve Passaic-ave.

Franklin, Pa.—Ordinances have been passed for new stone walks on Elk and Eagle-sts.

Burlington, Ia.—Brick paving is being urged for Main-st., from South to Wade.

Wellsville, O.—About $20,000 will be expended for street improvements and sewers.

Montgomery, Ala.—An ordinance has been passed to pave Madison-ave. E. B. Joseph, mayor.

West Stafford, Conn.—This town voted to appropriate $3,000 for building a macadam road.

Paris, Ill.—The paving of the east side of the public square and S. Main-st. is urged.

Sioux Falls, S. D.—Cement sidewalks have been ordered constructed in the business district.

Springfield, Mass.—Plainfield and Oak-sts. will be resurfaced with macadam.

Upper Alton, Ill.—Bids will be advertised for paving the three principal streets of this city.

Chicago, Ill.—The Illinois Manufacturers' association has started a crusade for good streets.

Moline, Ill.—The contract for paving Sixth-ave. with asphalt will probably be let about Aug. 15.

Altoona, Pa.—Ordinances have been passed to macadamize Willow-ave. and Sixteenth and Fifth-sts.

Delta, O.—Contracts will be let for about $40,000 worth of paving, according to press reports.

Elmira, N. Y.—The county supervisors have appropriated $10,000 for building macadam roads.

Chester, Ill.—The streets will be improved with gravel taken from the river bed at Crain's island.

East Orange, N. J.—Ordinances have been passed for asphalt paving on S. Fifteenth-st., from Sussex to Ninth-ave., and macad-

amizing and flagging a large number of streets. Stephen M. Long, cy. clk.

Leavenworth, Kas.—A resolution to pave Fifth-st., from Olive to Spruce, was adopted July 19.

Brooklyn, N. Y.—Asphalt paving has been authorized on Bedford-ave., Decatur, Monroe and Macon-sts.

St. Joseph, Mich.—The council has appropriated $20,000 for street paving. L. D. Townsend, clk.

Sellersburg, Ind.—The town trustees desire bids for about two miles of cement walks. R. F. Mix, clk.

Delphos, O.—An ordiance has been passed to macadamize Clay-st. C. C. Bliss.

Bridgeport, Conn.—The street committee has decided to macadamize Connecticut-ave. M. C. Cowles, st. comr.

Lincoln, Neb.—The city engineer has been directed to advertise for bids for repaving district No. 7 with asphalt.

Oshkosh, Wis.—It is believed that the contract will be let by Sept. 1 for paving Main-st. with brick.

Clarksville, Tenn.—The paving of two streets with asphalt or brick is contemplated. C. H. Bailey, recorder.

Hancock, Mich.—Mayor Scott favors the employment of an engineer to make plans for the proposed street paving.

Quincy, Ill.—Ordinances have been adopted for the construction of sidewalks on Locust, State and other streets.

Earl Park, Ind.—The people voted to issue $32,000 bonds for building about eighteen miles of gravel roads in Richland township.

Albany, N. Y.—An ordinance is pending providing for the paving of Park-ave., between Swan st. and Delaware-ave.

Anderson, Ind.—The city council has passed an ordinance for improving E. Ninth, W. Fourteenth and Delaware-sts.

Watseka, Ill.—An ordinance was passed July 2 providing for a cement sidewalk on two sides of the old town park.

Loogootee, Ind.—The citizens of this city and Perry township voted July to build sixteen miles of macadam roads and streets.

Stillwater, Minn.—The question of paving Main, Chestnut, Myrtle and Water-sts. with brick or asphalt is being discussed.

Birmingham, Ala.—An ordinance was adopted July 9 providing for the paving of Seventeenth-st., from Fourth to Seventh-aves.

Youngstown, O.—A resolution has been passed to curb and gutter Mulberry-st., between Mill and Market. William I. Davis, city clerk.

Wonewoc, Wis.—An ordinance was passed July 16 to pave Center-st., between Gordon and Jackson, with macadam. Village board.

Bowling Green, O.—A petition is being circulated to pave Main-st., from the Poe road to the Napoleon road, with brick.

Harrisburg, Pa.—An ordinance is pending in the council providing for an appropriation of $100,000 for paving and street improvements.

Sarnia, Ont.—The question of paving Christina-st. is being agitated. Vitrified brick, macadam and cedar block are advocated.

Holton, Kan.—An ordinance has been passed to build brick or concrete sidewalks on Vermont, New Jersey, Ohio, Wisconsin, Iowa, Kansas and Nebraska-aves., and Second, Third, Sixth, Seventh Eighth and Ninth-sts. Albert Sarbach mayor; Mary E. Walker, city clerk.

Green Bay, Wis.—Plans have been ordered drawn for paving an alley east of Washington-st., and between Walnut and Cherry.

Yonkers, N. Y.—The common council has recommended the adoption of plans and specifications for improving Highland-ave.

Marion, Ia.—The city council will consider Aug. 6 a proposition to pave Seventh-ave., Tenth, Eleventh and Twelfth-sts.

Jefferson, Ia.—A resolution is pending in the city council which provides for graveling certain streets. P. O. Brown, city clerk.

St. Paul, Minn.—Ordinances have been approved for relaying and reconstructing the sidewalk on Van Buren-st. and Snelling-ave., with cement block.

Newark, O.—A resolution has been passed to pave N. Third-st., from St. Clair to Charles, with brick or asphalt block. F. F. Maurath, cy. clk.

Harrisburg, Pa.—A resolution has been passed requiring the property-owners of Walnut-st., from Thirteenth to Reservoir park to pave the sidwalks.

Denver, Col.—A petition will be submitted to the board of public works asking for 5 miles of macadam paving in the finest residence district of the city.

Lafayette, Ind.—Resolutions have been passed to pave Ninth and Ferry-sts., with asphalt, Tenth-st. with gravel and an alley with brick. James K. Risk, cy. clk.

Roseville, N. J.—The residents of this city are anxious to have Seventh-ave., N. Eleventh, Gray, Second, Fifth and S. Fourteenth-sts., paved with asphalt.

Rock Island, Ill.—The property-owners on Thirty-eighth-st. have petitioned brick paving, from Fifth to Seventh-aves., and macadam from Seventh to Fourteenth-aves.

Cincinnati, O.—Resolutions have been passed to pave Pleasant-st., from Fifteenth to Liberty, with asphalt, and Imperial-st., from St. Clair to Nixon with macadam.

Orange, N. J.—The common council decided, July 2, to have an ordinance prepared at once for asphalt paving on Main-st., from East Orange to West Orange. Mayor Stetson.

New Orleans, La.—The question of paving Canal-st., from Liberty-st. to the cemeteries, with asphalt, has not yet been definitely decided upon. Mayor Capdeville.

Cambridge, Mass.—The construction of about 8,500 sq. yds. of brick paving on concrete foundation is contemplated. Day labor will be employed. I. N. Hastings, cy. engr.

Cincinnati, O.—Engineer King estimates that the costs of making repairs on the Union levee approaching the suspension bridge over the Little Miami river, will be $8,993.77.

Peru, Ill.—A petition is being circulated by Mayor Hoerner and Superintendent Weberling among the property-owners on Peoria-st., providing for 11 blocks of brick paving.

Ogden, Utah.—(Special.)—A. F. Parker, cy. engr., says there is some talk of constructing paving and sewers, but it is not probable that any york will be done this year.

Terre Haute, Ind.—The property owners on S. Seventh-st. have signed a petition for brick paving. A declaratory resolution has been passed, ordering paved the unpaved

portion of the sidewalks on S. Fifth-st., from Park to Farrington, and from College to Washington-ave.

Duluth, Minn.—The mayor has recommended paving for Michigan-st., from Sixth-ave., W., to First-ave., E., and Fifth-ave., W., from the railway tracks to Superior-st.

Dayton, O.—A resolution was adopted July 18 authorizing the city comptroller to advertise for bids for paving the unfinished sidewalks in a number of streets with stone, asphalt or cement.

Boston, Mass.—Asphalt, vitrified brick or macadam paving is contemplated for Tremont-st. The joint committee on appropriations has decided to appropriate $1,013,200 for street improvements.

Virginia, Tenn.—The council decided, July 17, to consider preliminaries in connection with street paving. An appropriation of $750 was also made for permanent gutters and grading on Piedmont-ave.

Minneapolis, Minn.—Resolutions have been passed providing for the construction of artificial stone sidewalks on a number of streets and for building bicycle paths on certain streets. L. A. Lydiard, city clerk.

New Haven, Conn.—The question of permanent pavements is being considered by the city council. Block asphalt is urged by some of the taxpayers for consideration. A number of petitions have also been submitted for brick paving.

Bay City, Mich.—City Engineer Turner is planning municipal work for 1901, included in which will be brick paving for Fifth, Sixth, Jackson, Van Buren, Sherman and Lincoln-sts. The residents of Fourth-st. are divided on the kind of material to use, both brick and asphalt being favored.

Newark, N. J.—A resolution of intention for paving Ridgewood-ave., from Clinton-ave. to Bigelow-st., with asphalt has been passed. The board of street and water commissioners is considering a proposed change in the specifications for asphalt pavements. A number of propositions are under consideration.

Detroit, Mich.—The board of public works recommended, July 17, that under the forced paving clause of the charter streets be paved as follows: McGraw, Grand River to Sixteenth, $10,864; Harper, Twelfth to Sixteenth, $8,048; Maybury, Grand, Grand Trunk railroad to Grand River-ave.; $16,640.

Winnipeg, Man.—The city engineer estimates the cost of asphalt pavement with stone curb on William-ave., from Princess to Charlotte, at $8,540, and on Elgin-ave. at $5,260. Asphalt paving is being considered for Lilly-st., and macadam paving for Lewis, Cauchon, Scott, Joseph and Balmoral-sts.

Newark, N. J.—A resolution was adopted July 19, requiring asphalt paving companies to repair the asphalt streets on which the guarantee expires this year. Notice of intention to pave Gray-st., from Warren-st. to the Morris & Essex railroad, in Roseville, with asphalt has been advertised, and an ordinance to pave Fourth-ave., between Roseville-ave. and N. Eleventh-st. has been ordered to a third reading. J. Crowell Mundy, genl. supt. wks.

Indianapolis, Ind.—Resolutions were adopted July 18 for cement walks and curbing on Arsenal-ave. and asphalt paving on Meridian -st., from Twenty-fifth-st. east to, south end of bridge over Fall creek; asphalt, with brick gutters, and resetting curb on Bellefontaine-st., from Massachusetts-ave. to Nineteenth-st. Petitions have been filed for block or asphalt pavement on Tenth-st., from Missouri to West, and from Senate-ave. to Missouri. Bird-st., from Ohio to New York, will be paved with asphalt.

Buffalo, N. Y.—Resolutions were approved July 18 for paving and repaving portions of Marion-ave., William Prenatt, Genesee and Ohio-sts. The ordinance providing for the paving of Main-st., between Goodell and Amherst, has been signed by Mayor Diehl. The council is considering a proposition of the asphalt paving companies to keep in repair for five years, after the expiration of the ten-year guarantee, pavements that may or may not have been laid after Jan. 1, 1900, at a cost not to exceed 5 cents a square yard for streets without car tracks and 8 cents for streets with car tracks.

CONTRACTS AWARDED.

Gloucester, Mass.—William Turner secured the contract for 2,000 ft. of paving.

Delta, O.—The contract for $40,000 of paving was awarded to C. W. Ryan, of Toledo.

New Haven, Pa.—Thomas McCabe secured the contract for improving Union-st., for $4,961.

Bessemer, Ala.—The contract for grading and paving with chert has been awarded to D. W. Houston.

New Haven, Pa.—Bernard O'Connor secured the contract for paving Main-st. for $5,000.

Hoboken, N. J.—Thomas McCabe secured the contract for improving Union-st. for $4,961.

Duluth, Minn.—The contract for macadamizing Fifth-ave. was awarded to W. P. Mayo, for $2,506.

Buffalo, N. Y.—The contract for paving Genesee and Best-sts., was awarded to the Barber Asphalt paving company.

Mt. Clemens, Mich.—The contract for brick paving was awarded to E. K. Roberts & Co. of Detroit, for $5.600.

Gas City, Ind.—(Special)Contracts for 3½ miles of cement sidewalks were awarded July 6 to M. H. Minnick.

Spokane, Wash.—The Alcatraz Paving company have awarded the contract for curbing four streets to Culver & Merwin.

Marion, O.—Scott & Hofstetter secured the contract for paving sundry alleys with brick, for $10,524.

Ansonia, Conn.—The contract for building a macadam road was awarded to the B. D. Pierce company of Bridgeport, Conn.,

White Plains, N. Y.—The contract for macadamizing Central and Lexington-ave was awarded to Erbach Bros., for $64,373.

Janesville, Wis.—P. W. Ryan secured contracts for macadam work on S. Second-ave., for $2,826 and on S. Jackson-st., for $1.084.

Whitesboro, N. Y.The contract for macadamizing the Yorkville road was awarded to Edward and Jas. E. Martin, of Utica. for $9,500.

Valparaiso, Ind.—The contract for building roads in Boone twp. was awarded to the Brownell Improvement company of Chicago for $41,240.

Alexandria, Ind.—The contract for brick paving and sidewalks was awarded, July

13, to W. J. O'Brien, of Elwood, Ind., for $31,426.

Rochester, N. Y.—Whitmore, Rauber & Vicinus secured the contract, July 20, for Medina block paving on Clinton-ave., for $22,048.74.

East Aurora, N. Y.—The contract for paving Main-st. was awarded, July 6, to John Miller, of Buffalo, for $37,800 for tarred macadam.

Oswego, N. Y.—A. McLaughlin secured the contract for a cement walk through Washington square and around the city hall, at 13 cts. a sq. ft.

Wauseon, O.—J. A. Foster, a contractor of Indiana, secured the contract for paving four streets in this city. Riggs & Sherman, engrs., Toledo.

Waterford, N. Y.—The contract for paving Broad-st., from the Union bridge to the lift bridge, was awarded July 5 to Mooney & Lillis of Troy.

Grand Rapids, Mich.—The contract for paving Sheldon-st. with block asphalt was awarded July 12 to the Luton Engineering company for $36,975.

Ypsilanti, Mich.—The contract for constructing 11,116 sq. yds. of brick paving has been awarded to Geo. H. Kneal, of Lansing, for $28,016.68.

Troy, N. Y.—The contract for furnishing 7,000 paving brick for repaving on Pawling-ave. was awarded to William Fitzsimmons at $29 per 1,000.

Joliet, Ill.—The R. F. Conway Co., of Chicago, was awarded the contract July 16, for paving Lincoln-st. with asphalt at $1.70 a sq. yd.

Urbana, Ill.—The contract for paving W. Elm-st. was awarded to Andrew Horr at $1.36 a sq. yd. for paving and 56 cts. a lin. ft. for curbing.

Ft. Dodge, Ia.—The contract for 2,900 sq. yds.of two course brick paving was awarded to the Likes Improvement company of Des Moines at $1.47 a sq. yd.

Kendalville, Ind.—The contract for constructing 8,000 sq. yds. of brick paving on Main-st. was awarded to C. E. Moellering & Co. of Ft. Wayne, Ind.

Sioux City, Ia.—The Barber Asphalt Paving company was awarded contracts July 10 for paving with asphalt Pierce, Douglas and Pearl-sts. at $2.08 a sq. yd.

Galion, O.—The contract for paving N. Columbus and S. Market-sts. was awarded to Raymond & Baker, and the public square and E. Main-st. to Baldwin & Graham.

Rome, N. Y.—Baker & Judson of Gloversville, secured the contract July 5 for paving E. Dominick, Buck, Neil and Railroad-sts. with brick for $16,071.30.

Maryville, Mo.—The contract for eight blocks of brick paving in the business section was awarded July 9 to A. E. Rutledge & Co. of Rockford, Ill., for $24,500.

Bridgeton, N. J.—The contract for asphalt block paving was awarded to the Philadelphia Block and Tile company of Philadelphia at $2.19 a sq. yd. or $66,000.

Greensburg, Pa.—The contract for paving Maple-ave. with brick was awarded to R. H. Hallam & Sons of Washington, Pa., at a price ranging from $20,000 to $30,000.

Watertown, N. Y.—Bids for macadamizing the roads in the new city park were received as follows: Brennan, Hodge & O'Brien, $23,586; Haley, Ward & Co., Flower bldg., $24,581; A. F. Nims, Philadelphia, N. Y., $25,211; James Driscol & Son, Brookline, Mass., $18,061; F. Kelley, Brookline, Mass., $23,735.

Putnam, Conn.—The contract for building a gravel or macadam road has been awarded to George D. Bardwell of Brooklyn, at 77 cts. a lin. ft. for gravel, and $1.71 for macadam.

Augusta, Ga.—The bids received for paving McIntosh-st. with brick were rejected as unsatisfactory, and the city decided to buy brick and have the work done by contract.

Louisville, Ky.—Contracts for asphalt paving were awarded to the Green River Asphalt company July 3. Bids were received July 17 for several blocks of brick paving from Lee R. Figg, Jack R. Gleason, Joe Nevin, Charles Mehler and Val Humpich.

Elmira, N. Y.—The Barber Asphalt Paving company, New York City, secured the contract July 17 for 10,000 sq. yds. of asphalt paving at $2.74 a sq. yd. for asphalt or concrete; 18 cts. for dressing and resetting curb; 58 cts. for new curb at setting.

Lewiston, Idaho—(Special)—The contract for improving E-st. and a part of Snake River-ave. was awarded June 20 to William H. Skinner for $11,568.50. The work includes clearing trees, curbing, crosswalks, culverts, gutters, macadamizing and silt wells.

Cleveland, O.—Bids were received July 11 for creosoted blocks for the Superior-st. viaduct, as follows: Michigan Pipe company, $9 per 1,000 sq. ft.; U. S. Wood Preserving company, $53.32; Chemical and Creosote company, $44.50; Walworth & Neville Manufacturing company, $54.40.

Milwaukee, Wis.—The Western Paving and Supply company submitted the lowest bid for paving Grove-st. with asphalt at $2.17½ a sq. yd. The other bids were: Warren-Scharf Asphalt Paving company, $2.20; Barber Asphalt Paving company, $2.25; Alcatraz Paving company, $2.33.

Quincy, Ill.—The contract for paving Twelth-st., from Broadway to Locust was awarded July 2 to Henry Rees at $1.09 a sq. yd. for brick, 38 cts. a lin. ft. for curbing; catch basins, $60 each; iron crossing plates, $7 each; 12-in. sewer, 50 cts.

Spokane, Wash.—Bids were received July 19 for paving Mill-st., as follows: Alcatraz company, $20,318.80 for constructing pavement and $1,583 for maintenance; Peter Costello, $20,444 for construction and $2,800 for maintenance. The bids were taken under advisement.

Milwaukee, Wis.—The contract for macadamizing Western-ave. was awarded to Arthur Fremming, as follows: grading, 38 cts. a cu. yd.; crushed stone, $1.04 a cu. sq. yd.; crushed stone screenings, $1.09 a cu. yd.; curbing, 30 cts. a lin. ft.; setting curb, 7 cts. a lin. ft.

Detroit, Mich.—John A. Mercier submitted the lowest bid, July 19 for paving Elizabeth-st., from Brush to Beaubien, with brick on concrete, at $1.77 a sq. yd. T. J. Kendall was the lowest bidder for granite block paving on concrete in Atwater-st., from Rivard to Riopelle, at $1.23 a sq. yd.

Wyoming, O.—The contract for the construction of the Springfield pike was awarded July 16 to the Louis Drach Construction

company for $20,708.80, and for Burns-ave. and all streets north of Wyoming-ave. and Wyoming-ave., and all streets south, to A. Colter, at $8,537.20, $17,582.90 and $29,199.75.

Atlanta, Ga.—The Southern Paving and Construction company of Chattanooga, Tenn., is reported as having been awarded the contract for paving Washington-st. with asphalt at $2.38 a sq. yd. The contract for paving Orme-st. wtih granite cubes was awarded to Venable Bros. at $1.78 a sq. yd.

Lincoln, Neb.—The Barber Asphalt company secured the contract for paving district 6, 10-year guarantee, at $2.03 a sq. yd. for 2-in. asphalt, with 1½ in. binder; 65c a cu. yd. or extra sand; $1.50 a cu. yd. for extra broken stone; $5 a cu. yd. for extra concrete; 15 cts. a lin. ft. for resetting old curb.

Allegheny, Pa.—Contracts have been awarded as follows: Grading Clayton-ave., North Side Coal and Sand company, $6,200; grading Michigan-ave., James P. Wall, $595; resurfacing old walks and building new walks in public park, Wadsworth Stone and Paving company, $6,275; grading, paving and curbing Wilson-ave., Ligonier block, James McAfee & Co., $13,155.

Ft. Wayne, Ind.—Paving contracts have been awarded during July, as follows: Main and Clinton-sts., asphalt, Barber Asphalt Paving company, $2.40 a sq. yd.; S Webster-st., asphalt, Bermudez Asphalt company, $8.78 per lin. ft.; Third-st., asphalt, Bermudez Asphalt company, $7.11 a lin. ft. C. E. Moellering & Co. secured the contract for paving Thomas-st. with Met. block at $645 a lin. ft.

Chicago, Ill.—The Barber Asphalt Paving company was awarded the contract July 16 for paving Michigan-ave., from Congress to Sixteenth-st. with asphalt for about $70,000.

Madison, Wis.—The contract for paving Pinckney-st., on the east side of the capitol park, was awarded June 30 to the Barber Asphalt Paving company of Chicago for $10,896.98.

Topeka, Kas.—Paving contracts were awarded July 17 as follows: Third and Tyler-sts., Charles B. Ramsey, $1.18 a sq. yd.; Willow, Lane and Walnut-sts., Wall & Hanley, $1.19 a sq. yd.

Detroit, Mich.—The contract for paving Rosedale and Kirby-aves. with asphalt has been awarded to the American Contracting company at $2.51 and $2.24 a sq. yd., respectively, according to press reports.

Seattle, Wash.—The contract for paving an alley in block 6, Maynard's addition, was awarded to Stirrat & Goetz for $1,937, and Flynn & Stanley the contract for improving Eleventh-ave at $3,034.

Washington, D. C.—The Barber Asphalt Paving company was awarded the contract for paving the streets and avenues in this city at $1.79½ a sq. yd. for asphalt roadway and $1.40 for vitrified block gutters.

Oshkosh, Wis.—The Hackworthy Construction company of Appleton submitted the lowest bid July 21 for paving Algona-st. with brick at $1.95 for Purington brick, $1.94 for terra cotta brick and block $1.96.

Buffalo, N. Y.—The contract for paving Main-st. with asphalt has been awarded to the German Rock Asphalt and Construction company, Ltd., for $111,179, and for widening the street and paving widened portions for $26,576.

Des Moines, Ia.—The contract for paving Eleventh-st., from Forest-ave. to State-st., 4,400 sq. yds., with brick was awarded to Cass Likes of this city at $1.52 a sq. yd.

Omaha, Neb.—Paving contracts were awarded July 21 at the following prices: Asphalt, Barber Asphalt Paving company, $2.06 a sq. yd.; brick, W. P. Mummaugh, $1.89 to $1.93 a sq. yd.; stone block, Hugh R. Murphy, $1.90 a sq. yd.

Joplin, Mo.—Patrick Moore of Kansas City, Mo., was awarded the contract for paving Main-st., from First to Tenth, with brick at $1.58 a sq. yd. W. H. Mahoney secured the contract for macadamizing Melvin-ave.

Marinetta, Wis.—Welch, Striffler & Paterson of Springfield, Ill., secured the contract July 11 for brick paving at $1.75 a sq. yd., and for macadamizing at 75 cents a sq. yd. Galesburg brick will be used.

Bristol, Tenn.—The contract for brick paving was awarded July 11 to the Virginia Paving Brick company for $20,000. This company secured the contract on the same date for brick paving in Bristol, Pa., for $30,000.

Kearny, N. J.—The contract for grading, curbing, guttering and flagging Kearny-ave., from Quincy to Midland, was awarded July 24 to David Harper of Newark, and for the improvement of Maple-ave to Edward Sargent.

Albia, Ia.—The Walsh Construction company of Davenport, Ia., was awarded the contract for paving the four sides of the public square at $1.44 a sq. yd. for paving, 50 cents a lin. ft. for curbing and 25 cents a cu. yd. for grading.

East Newark, N. J.—The contract for 4,000 sq. yds. of brick paving was awarded July 11 to the Newark Paving company at $2.23 a sq. yd.; for Mack block repressed, old curb reset, 2,000 ft., 25 cents; new curb on concrete, 3,000 ft., 50 cents.

Racine, Wis.—Alfred Williams was awarded the contract July 20 for 1,120 sq. yds. of cedar block paving, with curbing, etc., on Sixth-st., from Main-st. to Lake-ave., at 82 cents for paving, 45 cents for curbing and 15 cents for resetting curb.

Council Bluffs, Ia.—The contract for paving a number of streets was awarded to B. P. Wickham, July 17, as follows: N. Main st., from Broadway to Washington, Council Bluffs brick in both courses, $1.36½ a sq. yd.; Broadway, from Twelfth-st. to Indian creek, Des Moines brick on concrete, $1.89½; all other streets and avenues, Council Bluffs brick on Bootom courses and Des Moines brick on top courses, $1.67½.

Hoopeston, Ill.—Bids were received July 18 for paving E. Main and S. Third-sts. and Second-ave., as follows: H. C. Finley—E. Main and S. Third-sts., $1.14 a sq. yd.; straight curbing, 33½ cts. a ft.; circular curbing, 67 cts. a ft.; Second-ave., $1.08, 33 1-3 and 67 cts. Geo. H. Prutzman—E. Main-st., $1.12½, 33 and 66 cts.; S. Third, $1.13, 33 and 66 cts.; Second-ave., $1.07, 33 and 66 cts. The bids were taken under advisement.

Albany, N. Y.—Bids were received July 21 for constructing the Mamaroneck and White Plains road, as follows: Daniel Murray, Port Chester, $23,160; M. Decicco,

Larchmont, $24,974; McCabe & Duffy, White Plains, $27,643; C. H. Lutjens & Son, Long Island City, $27,713; G. A. Rogers, Plattsburg, $31,000; for constructing the River road in Erie county; German Rock Asphalt company, D. S. Morgan Bldg., Buffalo, $16,448; W. T. Leighton, Rochester, $17,300; Chambers & Casey, Powers block, Rochester, $17,900; Thomas Brown, 1127 Niagara-st., Buffalo, $18,380.

Pittsburg, Pa.—Contracts for repaving have been awarded to the Pennsylvania Asphalt company and the Pittsburg Asphalt Paving company at prices ranging from $2.53 to $2.55 a sq. yd. Other contracts awarded are: Repaving Cherry alley, $2.78, and Twenty-seventh-st., $1.89, Booth & Flinn; paving Twenty-first-st., $1.94, Evan Jones; repaving Ninth-st., $2.25, Keeling & Ridge; grading, paving and curbing Climax, S. Twentieth and Atwell-sts., Booth & Flinn.

Davenport, Ia.—The Flick & Johnson Construction company was awarded contracts, July 18, for brick paving on Thirteenth, Farnam and Harrison-sts., and macadam in Bridge and Belle-aves. The Davenport Granitoid company was awarded the contract for excavating at 25 cents a cu. yd., and curbing at 30 cts. a lin. ft. on Kirkwood boulevard, from Arlington to Bridge-aves. The contract for macadamizing the levee, between Main and Harrison-sts., at 85 cents a sq. yd.

Pottstown, Pa.—Bids were received July 16 for 9,000 sq. yds. of brick paving in High-st., as follows: John E. Wynkoop, Philadelphia, $1.90 to $2.19; Horace L. Albright, Philadelphia, $1.91 to $2.32½; Girard Construction company, Philadelphia, $1.69 to $2.14; Thos. Cunningham, Philadelphia, $1.94 to $2.12; Willhauer & Co., Pottstown, $1.96 to $2.41; McNeal & Haines, Easton, $2; Coryell Construction company, Williamsport, $1.65 to $2.05; Kitson & Co., Reading, $1.70 to $1.93; J. McGlathery, Philadelphia, $1.74 to $2.16; A. J. Connor, Philadelphia, $1.71 to $2.31.

Michigan City, Ind.—Bids were received July 9 for brick on S. Wabash-st., as follows: August Schneider—Grading, 18 cts. a cu. yd.; curbing, 28 cts. a lin. ft.; Indiana block, $1.27½; Met. wire cut, $1.31½; Canton repressed, $1.36; Perkins, repressed, $1.37; Medal, repressed, $1.37. C. H. Defrees—Grading, 16 cts.; Joliet curbing, 33 cts.; Bedford curbing, 33 cts; Indiana block, $1.35½; Porter block, $1.42; Canton represed, $1.47; Canton, wire cut, $1.41; Perkins block, $1.41; Terre Haute block, $1.40; Purington block, $1.45; Athens block, $1.54½; Nelsonville block, $1.54½. Action on bids was deferred.

Rochester, N. Y.—Bids for a Medina block pavement on Central-ave. were received July 16 as follows: Central-ave., Medina block pavement, estimate, $31,000. Whitmore, Rauber & Vicinus, $22,048.74; F. A. Brotsch, $22,370; Lauer & Hagaman, $22,892; Brayer & Albaugh, $22,751; H. N. Cowles, $24,061; Thomas Holahan, $24,379; Chambers & Casey, $24,449.14; H. B. Hooker & Son, $23,307; William H. Jones & Son, $24,515. For grading, cement walks and stone curbs on Pennsylvania-ave.: Whitmore, Rauber & Vicinus, $1,454.50; Elmer L. Oliver, $1,609.50; Brayer & Albaugh, $1,780.50; H. N. Cowles, $1,665; H. B. Hooker & Son, $1,533; James Holahan, $1,785; William H. Jones & Son, $1,947.50.

Bellefontaine, O.—Bids were received July 17 for paving Columbus-ave. and Main-st. as follows: Columbus-ave.—Fisher, Kiefer & Bailey, Wassail block, $11,743.15; Beaver Falls Paving company, with choice of Nelsonville, Athens and Wassail block, $11,933.14; C. B. Hall & Sons, Wassail block, $11,984.96; Jas. Wildes & Son, Medal block, $12,002.70; Ayres Asphalt Paving company, asphalt, $14,479.02; lighter surface, $13,315.32. Main-st.—Fisher, Kiefer & Bailey, Wassail block, $14,952.13; Beaver Falls Paving company, choice of Athens, Nelsonville or Wassail, $5,090.30; Myers, Hennessey & Co., Hallwood or Bolen brown granite block, $5,101.48. The contracts were not awarded.

New York City—Bids for repaving portions of forty-six streets in Manhattan and the Bronx were received July 11 as follows: The Atlantic Alcatraz Asphalt company, 57 E. Fifty-ninth-st., New York, submitted the lowest bid for 13,675 yds. of repaving in Sixth-ave., from Twenty-third to Thirty-third-st., at $3.15 a yd.; for 13,775 yds. of old granite block relaid, 42 cts. a yd.; for 4,500 lin. ft. of new curbing, 85 cts. a lin. ft.; for 500 ft. of old curbing, 35 cts.; and for 12 new manholes, $21.50. The lowest bids for the other less important work were as follows: W. One Hundred and Twenty-fourth-st., 4,225 yds., Barber Asphalt Paving company, $2.44; granite blocks relaid, 4,300 yds., 42 cts., E. Eighty-ninth-st., 6,635 yds., granite blocks relaid 6,685 yds., E. Eightieth-st., 5,885 yds., granite relaid 5,965 yds., W. Ninety-seventh-st., 5,525 yds., granite relaid 5,570 yds., Sicilian Asphalt Paving company, paving, $2.30, relaying 40 cts.; E. One Hundred and Forty-seventh-st., 5,600 yds., Barber Asphalt Paving company, $2.43; relaying 40 cts.; St. Ann's-ave., 8,200 yds., Asphalt Construction company, $2.44; relaying, 32 cts.; One Hundred and Sixty-second-st., 6,000 yds., Barber company, $2.48; relaying, 5,000 yds., 43 cts.; One Hundred and Thirty-seventh-st., 5,000 yds., same; One Hundred and Sixty-fifth-st., Barber company, $2.50.

SEWERS.

Marshall, Mich.—This city has refused to accept 1,080 ft. of the new sewerage system which has just been completed, and litigation is threatened.

Grand Rapids, Mich.—F. Melber, engineer and contractor of Pittsburg, has asked permission to submit prices on his combined steel and cement sewerage systems.

Newark, N. J.—South Orange Township has decided to drop out of the joint sewer scheme, which will necessitate a new apportionment of the cost among the various municipalities.

Cleveland, O.—The firm of Connelly & Son, to whom was awarded the contract for building a sewer in Scranton-ave., has refused to sign the contract because it contains the eight hour clause. The certified check for $1,000 accompanying the bid has been perfected by order of the department of public works.

Chicago, Ill.—The work of completing the Thirty-ninth-st. intercepting sewer will not be taken up again until fall or next spring. The city council, at its last meet-

ing ordered all bids for the work returned to the contractors. The council then adjourned not to convene again until Sept. 24.

Millville, N. J.—The city officials and residents of this city are considerably disturbed over a plan by the Vineland sewerage company to run the outlet of their sewer into the Maurice river and Union lake. The Millville board of health will endeavor to convince the state sewerage commission of the necessity of condemning the plan.

CONTEMPLATED WORK.

Oskaloosa, Ia.—A better sewerage system is needed.

Sharon Hill, Pa.—A sewerage system is contemplated.

Corsicana, Tex.—The sewerage system will be extended.

Franklin, Pa.—A sewer in Otter-st. is contemplated.

Red Wing, Minn.—The sewerage system will be extended.

New Britain, Conn.—A sewer in Greenwood-st. is contemplated.

Montezuma, Ia.—The construction of a sewer is proposed.

Susquehanna, Pa.—The construction of a sewerage system is proposed.

Coldwell, N. Y.—Plans for a sewerage system will be secured soon.

Des Moines, Ia—A sewerage system is being agitated for Highland Park.

Seymour, Ind.—The construction of three sewers is contemplated.

South Norwalk, Conn.—Bonds for building sewers in Whistleville have been voted.

Oakland, Cal.—The building of outlet sewers to the estuary is proposed.

Cooper's Creek, N. J.—A petition is being circulated for a sewer in Westfield,-ave.

Luverne, Minn.—This town voted to issue $10,000 bonds for a sewerage system.

Keyport, N. J.—The question of building a sewerage system is being considered.

Pasadena, Cal.—Several miles of sewers are contemplated. W. B. Clapp, cy. engr.

Albany, Ore.—The sewerage system will be extended to the eastern part of town.

Bristol, Va.—The city council contemplates building a sewerage system at once.

Whitesboro, N. Y.—The estimated cost of the proposed sewerage system is $45,000.

Woodbury, N. J.—The question of building a sewerage system is still being agitated.

Connellsville, Pa.—The town council contemplates the construction of a sewerage system.

Slayton, Minn.—Plans for a sewer in Broadway, from Morse to Superior, are being prepared.

Ogden, Utah.—Bids were authorized, July 9, for constructing sewers in sewer dist. No. 8.

Sandusky, O.—An ordinance has been passed to build a sewer in Putnam-st. A W. Miller, cy. clk.

Wauwatosa, Wis.—The question of issuing $30,000 bonds for sewers will be voted on Aug. 18.

Pipestone, Minn.—The question of issuing bonds for a sewerage system will be voted on.

Kansas City, Mo.—The South Side property-owners have petitioned for the construction of sewers.

Hastings, Mich.—The specifications for the Church-st. sewer have been adopted. Mayor Rogers.

Dexter, Me.—The question of sewers is being considered.

Willimantic, Conn.—A sewer in Pleasant-st. is contemplated.

Dayton, O.—Resolutions were adopted July 20 authorizing bids for lateral sewers in East Dayton.

Youngstown, O.—A resolution has been passed to build a sewer in Wallace-st. Wm. I. Davis, clk.

York, Pa.—An ordinance was passed July 9 authorizing a loan of $300,000 for a sewerage system.

Newburyport, Mass.—The question of building a sewerage system in ward 6 is being considered.

Somerset, Pa.—An additional $8,000 bond issue has been authorized to complete the sewerage system.

Chester, Pa.—The sewer committee has recommended the construction of two sewers this year.

Somerset, Pa.—This town voted, July 14, to issue $8,000 bonds for extending the sewerage system.

Sewerage systems are contemplated at the following places: Haddonfield, N. J.; Madison, N. J.; Auburn, Cal.

Middletown, O.—Plans for the Yankee road sewer were considered, July 14, by the sewer commissioners.

Redding, Cal.—The question of issuing bonds for sewers and street improvements is being considered.

Galion, O.—A resolution is pending for the reconstruction and repair of the Boston-st. sewer and laterals.

Summit, N. J.—The question of issuing bonds for the construction of a trunk sewer was voted on July 31.

Lansing, Mich.—The construction of a big sewer in the northwestern part of the city is contemplated.

Washington, Pa.—An ordinance has been passed for a sewer on Walnut-st. C. M. Brownlee, prest. coun.

Bayonne, N. J.—An ordinance has been passed to build a sewer in W. Thirty-first-st. W. C. Hamilton, cy. clk.

Cincinnati, O.—A resolution has been ordered prepared for a sewer in Esmonde-st., from Shadwell to Van Hart.

Pittsfield, Mass.—The board of public works voted, July 16, to lay 800 ft. of sewer pipe on Brown-st.

Emlenton, Pa.—A sewerage sytem has been designed for this city by H. J. McKinley, C. E. of Clintonville, Pa.

Lockport, N. Y.—Plans or a stone arch sewer along the western branch of Eighteen Mile creek have been authorized.

Columbus, O.—The sewer commission will visit a number of cities in the east to inspect sewage disposal plants.

Morton Grove, Ill.—Bids are desired for 1,309 ft. of sewer with or without material. Adolph H. Poehlmann.

Cleveland, O.—Plans for a sewer in Petrie-st., between Broadway and Nuss-sts., with an outlet in Morgan run, have been approved.

Tucson, Ariz.—Plans for a sewerage system are being prepared by Waring, Chapman & Farquhar, 874 Broadway, New York City.

Watertown, Minn.—The plans of City Engineer Carpenter for a complete sewerage

system have been approved by the city council.

Schenectady, N. Y.—Bids will be received soon for sewers in McClellan, Mohawk and Strong-sts. and Duane-ave.

Cleveland, O.—A resolution was passed July 20 to ask for bids for constructing the last section of the Walworth run sewer.

Redding, Cal.—The issue of bonds for street improvements and extending the sewerage system is being considered.

Holland, Mich.—The question of bonding the city for $10,000 for building a sewerage system was voted on July 30.

Bridgeport, Conn.—Surveys and maps for the proposed trunk sewer in Norman-st. have been completed by City Surveyor Scofield.

Benton Harbor, Mich.—The city engineer has been authorized to prepare plans and estimates for sewers in a number of streets.

Rock Falls, Ill.—Plans and specifications for about 7 miles of sewers have been prepared by G. L. Halton of Clinton, Ia.

Gardner, Mass.—This town voted to extend the Parker-st. sewerage system, and $45,000 was appropriated for this purpose.

Salina, Kas.—Plans and specifications for the extension of the sewerage system have been adopted and bids will be asked soon.

South Portland, Me.—The street committee has been authorized to ask for bids for constructing brick sewers on High, Stanford and other streets.

Brooklyn, N. Y.—Resolutions were adopted July 18 authorizing improvements in this borough to cost $1,000,000, of which $880,000 is for sewers.

Toledo O.—A new sewer district in that part of the city lying between Valentine and Randolph-sts. and back to the city line will be created.

Kingston, N. Y.—A preliminary report of surveys for the proposed sewers in the Second and Ninth wards has been submitted by City Engineer Bell.

Waterford, N. Y.—Plans and specifications for a sewerage system for the Eighth ward are being prepared, and bids will probably be received about Aug. 10.

The question of building sewerage systems is being agitated at the following places: Columbia, Conn.; Newbury, Conn.; Orangeburg, Conn.

Morristown, N. J.—Mayor Fox and Aldermen Hurtzig and Crane have been appointed a committee to consider ways and means for building a sewerage system.

Madison N. J.—A plan has been presented to the local board of health for the collection and disposal of sewage in this borough; estimated cost, $110,000.

Suffolk, Va.—The topographical survey, made by Van Hite Smith, preliminary to the construction of a sewerage system, has been accepted by the town council.

Evanston, Ill.—Permission has been granted the board of public works by the war department to extend the Emerson-st. sewer 500 feet into the lake.

Denver, Col.—Mayor Johnson signed a resolution July 12, directing the construction of a sewer in the vicinity of the Old Ladies' home in North Denver.

Syracuse, N. Y.—R. R. Stuart, city engineer, estimates the cost of a brick sewer in Chemung and other streets at $22,400. The citizens of East Syracuse have taken preliminary steps toward putting a sewerage system in that village.

Bowling Green, O.—Plans and specifications for the proposed new sewerage system have been adopted. Engineers Fraker and Riggs will superintend the construction.

Bozeman, Mont.—A committee has been appointed to take action toward putting in a sewerage system, and an engineer will be employed to prepare estimates. W. S. Davidson, chairman sewer committee.

St. Louis, Mo.—Ordinances have been approved establishing sewer districts and providing for the construction of sewers as follows: Rock Spring district No. 9, Dakota-st. district No. 1, Rocky Branch district No. 8.

Mobile, Ala.—The citizens passed a resolution at a recent mass meeting to the effect that it is the duty of the mayor and general council of this city and the boards of road and revenue of the county to cooperate and establish a drainage system to protect the city streets from overflow caused by rain.

CONTRACTS TO BE LET.

Elizabeth, N. J.—Bids are asked until Aug. 15 for brick and pipe sewers. W. A. Luster, Jr., cy. engr.

Waukegan, Ill.—Bids are asked until Aug. 6 for a culvert on Market-st. J. R. Dady, chrm. st. and br. com.

Middletown, O.—Sealed bids are asked until Aug. 6 for a sewer on Main-st. W. H. Todhunter, clk. bd. sewer comrs.

Hammond, Ind.—Sealed bids are asked until Aug. 14 for building a sewer in Webster-st. Peter J. Lyons, cy. C. E.

Dayton, O.— Bids are asked until Aug. 13 for building about 7½ mls. of 5 to 24-in. pipe sewers. R. J. Wood hamlet engr.

St. Paul, Minn.—Bids are asked until Aug. 2 for 740-ft. of 15-in. and 76-ft. of 12-in. pipe sewers. C. H. Bronson, clk.

Esplen, Pa.—Sealed bids are asked until Aug. 2 for building sewers in Brunot-ave. with lateral branches. E. I. Sutherland.

Princeton, Ill.—Bids are asked until Aug. 1 for 4,410 ft. 10-in. and 6,200 ft. 8-in. sewers; 38 manholes; S. L. Bradley, chrmn. sewerage com.

Toledo, O.—Sealed bids are asked until Aug. 6 for construction of sewers in Austin-st. and Millard-ave. and an alley. John E. Connell, cy. clk.

Alexander, La.—Sealed bids are asked until Aug. 1 for building about 9 miles of sewers, with manholes, flush tanks and pump well. Ira W. Sylvester, cy. engr.

Sauk City, Wis.—Bids are asked until Aug. 1 for building 1,570 ft. of 24-in. pipe sewers, 9 catchbasins, etc., the city to furnish the pipe. E. C. Newman, building clk.

Cincinnati, O.—Bids are asked until Aug. 7 for the construction of a 15 ft. culvert at the crossing of Lick Run and Columbia turnpike. Chas. G. Roth, clk. bd. pub. service.

Lead, S. D.—Sealed bids are asked until Aug. 11 for the construction of a general sewerage system. Separate bids will be received for the pipe work, brick and stone and tunnel work. W. J. Allason, cy. engr.

Hazleton, Pa.—Bids will be received about Aug. 10 for the construction of 7,000 ft. of 15-in. 2 D. S. Terra cotta pipe sewers on Grant

st. for an open channel and 2,000 ft. of stone arch sewer on Locust-st. A. Brooks Cellax, cy. engr.

Chicago, Ill.—Sealed bids will be received until Aug. 4 for constructing that part of the Thirty-ninth-st. conduit from Halsted to Butler-st.; also to install and maintain a temporary pumping plant consisting of two centrifugal pumps, with necessary piping and machinery to be located at the outfall of the Thirty-ninth-st. conduit. L. E. McGann, com'r. pub. wks.

CONTRACTS AWARDED.

Northampton, Mass.—The contract for the Hancock-st. sewer was awarded to W. H. Ricley & Co.

Darby, Pa.—Phillips & Co., were awarded the contract, July 12, for building sewers, for $3,031.35.

Stonybrook, Mass.—Jones & Meehan, of Boston secured the contract for sewer work in this town.

Riverside, Cal.—Ormond & Martin secured the contract for a number of lateral sewers, July 17.

Iron River, Wis.—The sewer contract was awarded to J. D. O'Connell, of Duluth, Minn. for $3,101.

Brookfield, Mo.—The contract for build- a sewer in district 11 was awarded, July 14, to P. McDonnell.

Butte, Mont.—H. M. Sanfield was awarded a contract, July 13, for a sewer in Copper-st., for $1,100.

Seattle, Wash.—The contract for the E. Marion-st. sewer was awarded to T. J. Peterson, for $1,850.

Cohoes, N. Y.—The contract for constructing a sewer on Factory-st., was awarded to William Stanton for $520.70.

Cincinnati, O.—The contract for a sewer in Wesley-ave., was awarded to Thomas P. Strack, July 14, for $365.50.

Parnassus, Pa.—The contract for a sewerage system was awarded to M. G. Kane, of Dayton, O., for $16,000.

Flint, Mich.—The contract for the Stevens-st. sewer was awarded, July 16, to E. W. Reed, at $1.80 a lin. ft.

Baltimore, Md.—P. Flannagan was awarded the contract for sewerage and piping in St. Paul's school building.

Sioux City, Ia.—The contract for a new storm sewer near the dry run on the West Side was awarded to W. H. Miehlke.

Shelton, Wash.—The contract for constructing about 2,750 ft. of 8-6 in. pipe sewers was awarded to Willey & Wood, for $1,098.70.

Wellsville, O.—Adams Bros., of Zanesville, O., secured the contract, July 14, for building a storm water sewer in this city.

Camden, N. J.—The contract for a brick sewer on Walnut-st., was awarded, July 20, to Aaron Ward, at $1.67 a lin. ft.

Seattle, Wash.—McAuley & Delany secured the contract for the sewerage systems in Main-st. and Twenty-sixth-ave. for $6,882.35.

Aberdeen, S. D.—The contract for several sewer extensions was awarded to Charles D. Symmes of Le Mars., Ia., for $10,163.

Webster, Mass.—The contract for building the Granite-st. sewer was awarded to C. E. Trumbull & Co. of Boston July 12 for $4,895.

Dorranceton, Pa.—The contract for constructing sewers in the Fourth ward was awarded to Bolton G. Coons of Kingston, Pa., for $6,625, double strength pipe to be used.

Madison, Wis.—The contract for sewers on Patterson and Blair-sts. was awarded to Nicholas Quinn at $3,770 and $1,000, respectively.

Laporte, Ind.—Ring & Swingendorf was awarded the contract for the Second-st. sewer extension July 23 at 84 cents a lin. ft.

Des Moines, Ia.—E. Van Dyke & Co. was awarded the contract for building a 21-in. sewer in Mulberry-st. at $1.59 a lin. ft.

Tomahawk, Wis.—Fred Krause of Wausau, Wis., secured the contract for building the sewerage system, including about 6,000 ft. of sewers.

Watertown, N. Y.—The contract for building trunk sewers in the Second, Third and Fourth wards was awarded to Haley, Ward & Co. for $71,000.

Augusta, Me.—E. R. Bean was awarded the contract for the construction of the last addition to the sewerage system that will be made this summer.

Syracuse, N. Y.—The contract for a 12-in. pipe sewer in Henderson-st., from Elm to Delhi, was awarded July 16 to C. & L. Merrick for $606.30.

Green Bay, Wis.—The contract for building a 69-in. sewer on Eleventh-st. was awarded to J. H. Case at $5.20 a lin. ft., or $2,970.

Vineland, N. J.—Jehiel Vaughn of Stamford, N. Y., secured the contract July 13 for building the sewerage system in this city for $32,984.10.

St. Louis, Mo.—The Hill-O'Meara Construction company secured the contract June 26 for building sewers in the Rocky Branch sewer district No. 7 for $39,573.

Hudson, N. Y.—The contract for a sewer in Fleet-st. was awarded to Marks Kearney at $1.70 a lin. ft.; two manholes, $10 each; two well holes, $15 each.

Gardner, Mass.—C. E. Trumbull & Co. of Boston secured the contract for building sewers and disposal works for the Parker-st. district for $15,472.

Blue Mountain Lake, N. Y.—The contract for a sewerage and water works system was awarded to Holroyd & Eveline of Waterford, N. Y., for about $18,000.

Onawa, Ia.—The contract for building the Woodbury-Monon county ditch was awarded the Canal construction company of Chicago at 7¼ cents a cu. yd.

Lansing, Mich.—Nicholas Urbanski secured the contract for a new sewer on Capitol-ave., July 9, at 32½c a lineal ft., and on Washington-ave., at 35¼c a lineal ft.

Racine, Wis.—Sewer contracts were awarded, July 24, as follows: Tenth-st., Reichert Const. Co., $2,938; Ninth, Elm, Cherry and Walnut-sts., Hawson & Thompson, $1,535.50.

Alexandria, La.—The contract for furnishing about 9 miles of 6-22 inch sewer pipe has been awarded to the Blackmer & Post Pipe company of St. Louis, for $5,510, according to press reports.

Rochester, Minn.—The contract for sewerage work was awarded to Charles Armstrong and Robert Elliott of this city, at 68c and 47c a lin. ft., including Y branches, detachable covers, etc.

Mt. Clemens, Mich.—Sewer contracts were awarded, July 10, as follows: Sewer between Second and Third-sts., Joseph Loch & Co., 17 cts. a ft.; between First and Sec-

ond-sts., Merdue & Donschlager, 20 cts. a ft.

Bristol, Conn.—The sewer contract on Stearns-st., and the relaying of the sewer on Maple-st., was awarded to P. J. Coleman at 75cts a lin. ft. for earth excavation, and $3.95 for rock excavation.

Fort Dodge, Ia.—The contract for a sewer on Third-st., has been awarded to Hurly & Peterson of this city, as follows: 2,000 ft. 10-inch pipe, 67 cts. a ft.; four man-holes, $32 each; flush tank, $55; lamp hole, $9.

Hartford, Conn.—The Hartford Paving & Construction company, which was awarded the contract for 9 miles of sewers in the East Hartford fire districts, was granted permission, July 18, to sub-let a portion of the contract to A. M. Banker, Gloversville, N. Y.

Allentown, Pa.—An ordinance granting a franchise to the Allentown Sewerage company for the use of the city's streets has been referred to the board of health. The franchise is for fifty years, the city having the privilege to purchase the system after twenty years.

Pittsburg, Pa.—Bids were received again July 14 for Soho sewers, the first bids being rejected as too high. The bids received the second time were considerably lower than those first received. It is believed that Kealing & Ridge wil receive the contract, the total of their bid being about $5,500.

Springfield, Mass.—Sewer contracts have been awarded as follows: Mill-st. intercepting sewer, Bruno, Salomone & Petilto, of East Boston, $39,981; Dickinson-st., Michael Curtis of Springfield, $44,516; Carew-st., Maloney & Peterson of Springfield, $22,531; Springfield-st. and Glenwood sewer, Maloney & Peterson, $20,173.

Milwaukee, Wis.—The contract for the extension of the sewer on Thirtieth-st., from North-ave. to Wright-st., 1,367 ft. was awarded to R. J. Hickey at $23.85 a lin. ft. Contracts for pipe sewers in Park Hill, Pryor, Summit, Oakland and Cambridge-aves. and Ellen, Seeley and Burleigh-sts. and Folsom-place were awarded, July 10, to Daniel O'Driscoll and F. H. Nakielski, for $4,420.62.

Philadelphia, Pa.—Bids were received July 20 for constructing main and branch sewers at an estimated cost of $160,000. The lowest bids were as follows: Relief of Cohocksink sewer on Shackanaxon-st., Berhard J. Sullivan, $29.80 a lin. ft. for 9-ft. 6-in. section; $28.32 for 9-ft. section, $1,700 for junction chamber. Extension of Montgomery-ave. sewer in Sydenham-st., Howard E. Ruch, $19.45, $15.81 and $14.52 a lin. ft., according to location. Relief on McKean-st. sewer on Swanson-st., Richard Walsh, $46.32 a lin. ft., $2,154 for junction chamber; Godfrey-ave., across Broad-st. and Olney, Daniel Dooley, $22 and $23.50 a lin. ft.

WATER-WORKS.

Muscatine, Ia.—The people voted to purchase the water plant for $100,000.

Eau Claire, Wis.—The city has refused to purchase the water plant for $272,000, claiming that the price is $70,000 too high.

New York City.—Brooklyn is threatened with a water famine, and stringent measures will be required to make the supply hold out.

Montclair, N. J.—The council is considering a proposition from the West Jersey Water company for a franchise to furnish this town with water.

St. Charles, Mo.—A resolution has been adopted by the citizens' water works committee recommending the city council to offer the Water and Improvement company $63,000 for the present water works plant.

Newark, N. J.—The expert evidence introduced by the city in the hearing in chancery court in its suit against the East Jersey Water company, shows the existence of startling defects in the water shed.

Elizabeth, N. J.—The Elizabethtown Water company asked the East Jersey Water company to furnish it 2,000,000 gallons of water a day until the driven wells plant, now being constructed at Springfield for the supply of this city, is completed.

Chicago, Ill.—The additional water supply for the new ten-foot in-take tunnel is now being delivered into the mains. The new pumping station at Central park has three Worthington engines of 20,000,000 gallons daily capacity and six Scotch boilers.

Babylon, L. I.—The village trustees renewed for one year, July 18, the contract with the Sumpwanus Water Works company. The contract requires the village to pay $45 a month for each cart used for street sprinkling, and $30 per annum for each of the thirty-eight fire hydrants.

Kankakee, Ill.—On application of the Farmers' Loan and Trust company of New York, the Chicago Title and Trust company was appointed July 11 receiver for the Kankakee Water company and the Kankakee Water Supply company of Illinois and the Kankakee Water Works company of West Virginia.

Atlanta, Ga.—Col. Park Woodward, superintendent of water works, states that cost of mechanical filtration of water works during 1899 was $1.35 per million gallons. The total cost was $2,595.46, or, itemized, as follows: Alum, $1,404.80; wages, $1,003.75; wash water, $112.16; heating, $19; maintenance, $55.75.

Oakland Cal.—The Contra Costa Water company has refused the city experts permission to examine the stock ledger of the company. Permission was granted city to inspect some of the books, only to find that the books they desired to see had been destroyed by fire. The refusal to examine the stock ledger is not understood. Engineers will probably have to be employed to estimate the value of the plant.

CONTEMPLATED WORK.

Albert Lea, Minn.—Water meters are proposed, Mayor Dunn.

Anaconda, Mont.—A new reservoir is contemplated.

Joliet, Ill.—Means to increase the water supply are being considered.

Clayton, Del.—The council has decided to lay 600 ft. of water mains.

Meridian, Miss.—The question of a pure water supply is being discussed.

Hammond, Ind.—Mayor Reilley is urging the need of a better water supply.

Cape May, N. J.—A second water main will be laid down Broadway in West Cape May.

Brewster, N. Y.—Plans for a water supply will be made by E. Wegmann of Ketonah, N. Y.

Casper, Wyo.—The purchase of $5,000 of

cast iron water pipe is proposed by the town board.

Muncie, Ind.—The city water has been pronounced impure and unfit for use.

Charlottesville, Va.—The city council adopted the meter system July 12.

Wheaton, Minn.—Bids will probably be asked Sept. 1 for a water works system.

Ligonier, Ind.—About $85,000 will be expended on improving the water works plant.

Fort Worth, Tex.—A committee has been appointed to consider the water question.

Mt. Vernon, O.—Plans are being considered for an emergency water supply. Supt. Koons.

Peekskill, N. Y.—The question of an increased water supply will be voted on in September.

Harrisburg, Pa.—A purchasing board for a new pumping engine will be organized at once.

Sidney, Neb.—Bids for building water works are desired at once. J. J. McIntosh, chrmn. bd.

Lancaster, Pa.—Plans and specifications for a water works system will be made by W. M. Small.

Calhoun, Ky.—Estimates have been prepared for water works by Alfred Walker of New Albany, Ind.

Alliance, O.—Ordinances have been passed for improving the water works plant. J. H. McConnell, cy. engr.

Pueblo, Colo.—A new reservoir is contemplated to furnish this city with a better water supply.

Salt Lake City, Utah.—This city voted to sell $250,000 bonds for increasing the water supply, July 16.

Ogden, Utah.—The city engineer has been instructed to make plans and specifications for a new water works system.

Moline, Ill.—Mayor Werne will now push the plans for a filter plant for the water supply of the city.

Brooklyn, N. Y.—The board of public improvements has authorized the expenditure of $64,490 for water mains.

Fulton, N. Y.—A special election will be held Aug. 7 to vote on two propositions relating to municipal water works.

St. Charles, Mo.—A new municipal water plant is proposed, instead of purchasing the old plant, according to press reports.

Pontiac, Mich.—The question of expending $50,000 in improving the water works system will be voted on Aug. 1.

Los Angeles, Cal.—The city engineer has been directed to prepare estimates for a new pipe line to furnish water to Westlake park.

Greene, Ia.—Preliminary plans for a water works system will be made by the Des Moines Bridge and Iron works. Fred L. Stober, clk.

Algonac, Mich.—The committee on special improvements has been instructed to decide on plans and advertise for bids for water works.

Jamestown, N. D.—This city will probably vote on the question of a pumping plant for the water works or an artesian well.

Harrisburg, Pa.—An ordinance, directing the special committee to employ an expert to ascertain the cost of a filter plant, has been passed.

Dallas, Tex.—An ordinance has been passed providing for the issue and sale of $100,000 bonds for water works and sewer purposes. I. A. Moore, cy. secy.

Barberton, O.—Bonds for $15,000 have been sold for proposed extension and improvements in the water works. Wm. S. Mitchell, clk. bd. w. w. trustees.

Lakewood Hamlet, O.—(Special)—A bond issue of $43,000 will be voted on Aug. 14 to furnish the hamlet with a pumping plant for the water system. R. J. Wood, C. E.

The question of issuing water works bonds will be voted on as follows: Geneva, O., Aug 25; Homer, Mich., Aug. 13; Wallington, N. J., Aug. 14; Ashtabula, O., Aug. 25.

The question of issuing water works bonds has been favorably voted on at the following places: Kirkman, Ill.; Manson, Ia.; Comanche, Tex.; Pawnee, Okla., Smyrna, N. Y.; Balaton, Minn.

The construction of water mains extensions is contemplated as follows: Elgin, Ill.; Fredonia, N. Y.; Cherryvale, Kas.; Davenport, Ia.; Rockville, Conn.; Freeport, L. I., N. Y.

St. Cloud, Minn.—The state board of health has directed this city to devise a system of filtration for the city water supply and submit it to the board by November.

Medina, N. Y.—The water supply of the town is inadequate and the village trustees have ordered the water company to increase the supply to 1,000,000 gals. per day, as provided by its contract, within six months.

The construction of water works systems is contemplated at the following places: Sebastopol, Cal.; Harmony, Minn.; Vermontville, Mich.; Oakland, Ill.; North Chicago, Ill.; La Follette, Tenn.; Elma, Ia.; Moscow, N. Y.; El Dorado, Ark.; La Motte, Ia.; West Plains, Mo.; Tabor, Ia.; Houstonville, Pa.

Lewiston, Idaho—(Special)—The Lewiston Water and Light company has announced that it will build a new 1,000,000-gallon reservoir to supply the lower parts of the city and use the present reservoir to supply the upper parts of the city, coupling the two in case of fire or better pressure. It is stated about $20,000 will be spent in bettering the service generally. It is not believed the city will do anything further toward purchasing the works this year.

CONTRACTS TO BE LET.

Mitchell, S. D.—Bids are asked until Aug. 6 for 1,600 ft. of 6-in. water mains.

Nunda, Ill.—Bids are asked until Aug. 3 for constructing water works. E. G. McCollum, secy.

New Iberia, La.—Sealed bids are asked until Aug. 9 for completing the water works and electric light plant. A. J. Cammack, cy. clk.

Marquette, Mich.—Sealed bids were asked until Aug. 10 for furnishing 600 ft. 42-in. riveted steel pipe, with connections. John Krey, cons. eng.

Pierson, Ia.—Bids are asked until Aug. 7 for the construction of a water works system. B. O. Blake, town recorder. H. J. C. Pearson, mayor.

Walden, N. Y.—Bids are asked until Aug. 3 for a driven well plant, boiler and chimney, and otherwise improving the works. Charles Riverburg, clk.

Randolph, Neb.—Bids are asked until Aug. 7 for furnishing and laying about one-half mile of small water pipe. H. S.

Fisher, vil. clk.; Arnold C. Koenig, engr., Grand Island, Neb.

Red Oak, Ia.—Sealed bids are asked until Aug. 6 for the construction of water mains, with necessary crosses, street valves, etc. M. E. Moulton, cy. clk.

Washington, D. C.—Bids are asked until Aug. 16 for furnishing sluice gates, valves, water pipe, etc. Lt.-Col. A. M. Miller, U. S. Engr., Washington Aqueduct.

Orange, N. J.—Bids are asked until Aug 6 for the construction and erection of water pressure pumping engines at Campbell's Pond, Milburn twp. John J. Cuddy, chrm. water comrs.

Steelton, Pa.—Bids are asked until Aug. 16 for furnishing the materials and laying about 8,000 sq. yds. of concrete, asphalt and brick lining for the reservoir. J. D. Young, secy.

Detroit, Mich.—New bids will be received Sept. 11 for two 25,000,000 gal. pumping engines. The bids received recently were rejected as too high. J. W. McGrath, prest. bd. water comrs.

St. Louis, Mo.—Sealed bids are asked until Aug. 7 for furnishing the following 5,390 tons of cast iron coated water pipes, 170 tons of cast iron coated special castings, and seven 36-in. stop valves and one 36-in. check valve, at High Service pumping station. Robert E. McMath, prest. B. P. I.

CONTRACTS AWARDED.

Petersburg, Ind.—The contract for building a new water works system was awarded to Frank Schofold of New Albany.

Sisterville, W. Va.—The contract for building a reservoir was awarded to John J. Rea of this city for $7,250.

Central Falls, R. I.—A contract was awarded by the city of Pawtucket July 19 for furnishing the city with water for ten years.

Jackson, Mich.—The contract for improving the water works system was awarded July 16 to J. E. Bacon of New York City for $18,500.

Brookhaven, Miss.—The contract for improvements to the water works was awarded to McDaniel & Porter of McComb City, Miss., for $5,000.

Coshocton, O.—The Snider-Hughes company, of Cleveland, secured the contract for furnishing a 2,000,000 gal. pumping engine for $5,600.

Baker City, Ore.—The contract for building the water works was awarded to Fife & Conlan, of Spokane, Wash., for $87,791.

Lesterville, S. D.—The contract for furnishing and laying 2,000 ft. of 6-in. water pipe was awarded to W. L. Bruce, of Yankton, for $2,165.

Washington, D. C.—The contract for furnishing two 20,000,000 gal. pumps was awarded to the Edward P. Allis company of Milwaukeke, for $148,000.

Cincinnati, O.—Contracts were awarded July 6 as follows: Deep well pump at California water works. Hendricks Manufacturing company, $11,986; tunnel and shaft for supplying water to the western pumping station, W. J. Gawne & Co. of Cleveland, $308,164.80.

Quincy, Mass.—Bids for the construction of a standpipe on Forbes Hill have been received by the Metropolitan water board as follows: Walsh's Holyoke Steam Boiler Works, $4,425; E. Hodge & Co., East Boston, $4,498; Edward Kendell & Son, Cambridgeport, $5,939; R. D. Wood & Co., Philadelphia, $6,720.

Blue Mountain, N. Y.—The contract for building a water works and sewerage system was awarded to Holroyd & Eveline, of Waterford, N. Y., for $18,000.

BRIDGES.

Milo, N. Y.—The town board has decided to build a steel bridge.

Charlevoix, Mich.—The question of building a new bridge is being agitated.

Colchester, Ill.—This town voted to build a new bridge over Troublesome creek.

Wabash, Ind.—Bids are asked until Aug. 13 for ten bridges. B. F. Clemens, co. audt.

Wilmington, Del.—The question of building seven new county bridges is being agitated.

Saegertown, Pa.—A bridge over French creek is contemplated by the county commissioners.

Scottsville, Va.—A new bridge to replace the present one across Scotts creek is proposed.

Tampa, Fla.—Bids are asked until Aug. 15 for a bridge over Alafia river. Co. comrs.

Bridgeport, Conn.—The selectmen voted to build an iron bridge over Cotton Mill Hollow.

Pittsburg, Pa.—Plans are being prepared for a steel bridge over the Monongahela at Tenth-st.

Medina, N. Y.—The contract for a new bridge over the canal was awarded to John Horan for $51,099.

Ottawa, O.—Bids are asked until Aug. 2 for a bridge over the Auglaize river. Louis N. Wilde, co. audt.

Linneus, Mo.—Bids will be received until Aug. 6 for building a wooden or iron bridge. Fred Perry, co. comr.

Vincennes, Ind.—Bids are asked until Aug. 7 for three steel bridges with steel abutments. J. S. Spiker, engr.

New York City.—The contract for the Riverside viaduct was awarded July 19 to A. C. Gildersleer for $200,000.

Stevenson, Wash.—Bids are asked until Aug. 6 for a bridge over a tributary of the Columbia river. Co. comrs.

Somerville, N. J.—A steel girder bridge at Hamilton-st., Bound Brook, has been decided upon by the freeholders.

Stevenson, Wash.—Bids, including plans and specifications, are asked until Aug. 6 for a bridge 230 feet long. Co. comrs.

Stockton, Cal.—Bids are asked until Aug. 7 for a steel span bridge on lower Sacramento road. Otto Grinsky, clk. co. survrs.

Visalia, Cal.—Bids are asked until Aug. 7 for a bridge over the Fule river, in twp. 21. John Cutler, jr., clk. bd. supvrs.

San Andreas, Cal.—Bids are asked until Aug. 18 for a bridge across Angels creek. J. S. Jack, clk. co survrs.

Franklin, Pa.—A company has been organized to build a bridge to be used for street cars and vehicles across the Allegheny river.

Shreveport, La.—Bids are asked until Aug. 9 for a bridge over Horseshoe bayou and one over Dooley bayou. A. L. Duringer, clk.

Keyport, N. Y.—The contract for building the Mott-st. bridge has been awarded to

the Wrought Iron Bridge company for $19,900.

Wyoming, Ia.—A bridge is proposed across the Wapsie.

Grand Island, Neb.—(Special.)—Bids are asked until Aug. 14 for two undertruss combination bridges of 200 feet span each. Carl H. Menck, co. clk.

South Bend, Ind.—Sealed bids are asked until Aug. 15 for building a steel bridge across the St. Joseph river at Sample-st. co. comrs.

Bedford, Ind.—Sealed bids are asked until Aug. 6 for repairs to the bridge over White river at Davis Ferry. John M. Gainy, co. audt.

Portland, Ore.—Sealed bids are asked until Aug. 4 for the reconstruction of the Madison-st. bridge swing span. William B. Steele, chm. co. comrs.

Camden, N. J.—Bids are asked until Aug. 10 for a steel highway bridge over Cooper's creek. James D. Wilkinson, chm. bd. com; J. J. Albertson, co. engr.

North Adams, Mass.—Bids are asked until Aug. 4 for building the steel superstructure of two plate girder highway bridges. J. I. Temple, comr. pub. works.

Albany, Ore.—Bids are asked until Aug. 9 for a Howe truss covered bridge across the South Antrain river, near the mouth of McDowell creek. W. J. Hammer, clk.

Natchitoches, La.—Bids will be received by the Natchitoches Ry. & Const. Co. until Aug. 6 for a bridge over the Red river at Grand Cave. D. C. Scarborough, Prest.

Taylorville, Ill.—The board of surveyors has ordered bridges over Bear creek, Bear Creek twp.; Lick creek, Bear Creek twp.; three over Locust creek, in Locust twp.

Milwaukee, Wis.—Bids are asked until Aug. 7 for building a highway bridge across the Milwaukee river at Grand-ave. G. W. Porth, depty. compt.; Chas. J. Poetsch, chm. B. P. W.

New York City.—Bids are asked until Aug. 9 for the construction of the steel and masonry approaches on both the Manhattan and Brooklyn side of the bridge. East River Bridge Comrs.

Dubuque, Ia.—Plans for the proposed bridge across the Mississippi river at Eagle Point have been submitted to C. H. Meyer, president of the Eagle Point Bridge company.

Russellville, Mo.—Bids for plans will be received until Aug. 7 for a steel bridge across the South Moreau at McCann Ford, and until Aug. 8 for building the bridge. F. W. Roer, co. clk.

Charlottetown, P. E. I.—Bids are asked until Aug. 10 for the substructure of a combined highway and railroad bridge across the Hillsboro river. Ch. engr. Intercolonial Ry., Moncton, N. B.

Redwood Falls, Minn.—The county commissioners of Redwood and Renville counties have perfected arrangements for a new steel bridges across the Minnesota river between Swedes Forest and Sacred Heart twps.

Chicago, Ill.—Bids are asked until Aug. 6 for the superstructure for a single track railway bridge across the Illinois and Mississippi canal at R. R. Falls, Major J. H. Willard, U. S. Engr., 1637 Indiana-ave. Bids are asked until Aug. 8 for building a bridge over the Chicago river at Canal-st. Wm. Boldenweek, prest. bd. trustees.

PARKS.

Waukegan, Ill.—A park district is proposed for this city.

Findlay, O.—A petition has been submitted to the council asking that the old fair grounds be converted into a park.

Philadelphia, Pa.—Contracts for the improvement of squares were awarded July 10 as follows: Dickson Square, sodding, laying out walks, etc., A. T. O'Connell, $9,771; Momralti and Folteral Squares, Smith & Davies, $2,792 and $4,175 respectively.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Centerville, Ia.—A garbage crematory is contemplated.

Watervliet, N. Y.—Bids for cleaning the streets and alleys will be advertised.

Watervliet, N. Y.—The garbage contract was awarded to John Christie for $1,774.

Findlay, O.—The board of health has decided to recommend a garbage crematory.

Salt Lake City, Utah.— Anew crematory is proposed to replace the one destroyed by fire.

Geneva, O.—A resolution has been passed to sprinkle N. Broadway-st. D. G. Palmer, mayor; R. C. Ewing, clerk.

Hammond, Ind.—Mayor Reilly has recommended the purchase of a street sweeper that will take up the dirt it sweeps.

Sioux City, Ia.—The city council is considering a proposition made by Charles E. Golteman to put waste paper boxes on the street corners.

South Orange, N. J.—Bids are asked until Aug. 2 for performing scavenger work for a term of one year. John Williams, village clerk.

Utica, N. Y.—The contract for removing ashes, rubbish and street dirt was awarded to William Pritchard for a term of two years at $14,784.

Swayzee, Ind.—(Special.)—This town contemplates the purchase of a small garbage furnace. Correspondence is solicited. John T. Anderson, health officer.

Indianapolis, Ind.—A contract for placing waste paper boxes on the sidewalks for 20 yrs. has been awarded to the Indianapolis Clean Street company.

Brooklyn, N. Y.—The street cleaning department is considering methods for garbage disposal and bids will probably be advertised soon for plants.

Camden, N. J.—Bids are asked until Aug. 8 for furnishing the street department with one sweeping machine and three iron carts. C. H. Ellis, jr., chrmn. com.

Brooklyn, N. Y.—Commissioner of Street Cleaning Iglehart contemplates visiting a number of cities to investigate garbage disposal plants, garbage collection and street cleaning methods.

Syracuse, N. Y.—Sprinkling contracts were awarded July 16 as follows: J. W. Cronin, $1.99, $1.50 and $1.40 per 1,000 ft.; Roger McKinley, $1.95; H. J. Lischor, $1.40; F. J. Baker, $1.40.

Mexico, D. F.—(Special.)—Luis G. Rocha & Co., who have the contract to furnish the necessary machines and implements for street cleaning and sprinkling, desire

illustrated catalogues with the very lowest prices and terms under separate sheets for the following: Street cleaning machines, 4 wheels, 2 horses; street sweeper, 2 wheels, 1 horse; sprinklers, 330 to 400 gals., 4 wheels, 2 horses; sprinklers; 155 to 180 gals., 2 wheels, 1 horse; cars laminated inside and covered, 125 cu. ft. capacity, 2 wheels, 1 horse; cars, system of pails to carry wastes of the streets; pails for refaction; hand sweeping machines; drag scrapers; iron shovels, and, in general, all of the new implements for street cleaning.

Bangor, Me.—Bids were received July 17 for furnishing a system of garbage disposal as follows: Dixon Garbage Crematory company, Toledo, O., submitted two proposals, the first for a furnace 53½ ft. long, having a capacity of 15 tons every 24 hours, with an iron stack, $6,500; with stack made of part brick and iron, $6,950. The second proposition is for an iron furnace 38½ ft. long, having a capacity of 25 tons, $5,500; brick and iron, $6,000. The Wright Crematory company, Chicago, Ill., submitted a proposal for an iron furnace, with steel smoke stack, 75 ft. high and 3 ft. in diameter, $6,550. This company guarantees to burn all kinds of refuse, without smoke or odor. The Morse-Boulger Co., New York, submitted figures under these propositions. First, a furnace 28 ft. long, 10 ft. broad, guaranteed to burn 15 to 20 tons of garbage every 10 hours, $4,850; second, furnace of the same size as above, to be covered, frame of wood and corrugated iron roof, walls and approaches erected, steel smoke stack, $5,850; third, iron furnace, walls and approaches, patent steel chimney, 70 ft. high, self-supporting chimney to be lined one-half way up with fire brick, 36-in. flue, base bolted down to brick foundation, $6,850.

STREET LIGHTING.

Hedrick, Ia.—Bids will be asked for erecting an electric light plant.

Ann Arbor, Mich.—Sealed bids will be received until Aug. 6 for 120 arc and two incandescent lights. City clerk.

Shakopee, Minn.—Sealed bids are asked until Aug. 6 for building an electric light plant. H. J. Peek, mayor.

Houston, Tex.—Bids will be asked for the construction of an electric light plant. Mayor Brashear.

Jefferson City, Mo.—Plans and specifications have been submitted for a municipal electric light plant.

Huntsville, Ala.—The city council voted to cancel July 20 the contract with the Huntsville Electric Light company.

The question of issuing bonds for electric light systems will be voted on at the following places: Yord, Pa., Tamaqua, Pa.

Manchester, Ia.—The question of granting a franchise for an electric light plant is being considered by the council.

Richmond, Ind.—Plans and specifications for a municipal lighting plant will be made by James B. Nelson of Indianapolis.

Owensboro, Ky.—The contract for the electric light plant was awarded to Westinghouse, Church, Kerr & Co. of Chicago for $45,200.

Lincoln, Neb.—Plans and specifications have been approved for lighting this city, and bids will be asked at once. Adna Dobson, cy. engr.

The question of issuing bonds for electric light plants has been favorably voted on as follows: Hedrick, Ia.; Belleville, Kas.; Fairport, N. Y.

Hagerstown, Md.—The contract for a municipal electric light plant was awarded July 11 to Geo. A. Williams of Jersey City for $52,590.20.

Oskaloosa, Ia.—Sealed bids are asked until Aug. 20 for lighting this city for 15 yrs. Propositions may be for 5, 10 or 15-yr. terms. C. E. Munroe, cy. clk.

Columbus, O.—The city council is urged to take charge of and operate the electric light plant, and to enlarge it sufficiently to furnish lights for the whole city.

La Crosse, Wis.—The advisability of renewing the contract with the LaCrosse Brush Electric Light and Power company for lighting the streets of this city is being considered.

Hastings, Neb.—The contract for a municipal electric light plant was awarded to the Southern Electric Supply company, and the General Electric company of St. Louis for $24,000.

St. Louis, Mo.—The Welsbach Lighting company of Philadelphia was awarded the contract for lighting the streets and alleys in the residence districts at $27.97 per lamp per yr.

Toluca, Ill.—Wm. F. Jenson of Mendota has proposed to install an electric light plant in this city and furnish 30 arc lights of 2,000 c. p. at $5 per month per light.

San Francisco, Cal.—The contract for lighting the public buildings with electricity was awarded, July 7, to the Independent Light & Power Co. at 3.95 cents per 1,000 watts hour.

Grand Island, Neb.—(Special.)—The council committee on light has recommended an appropriation of $5,000 for an electric light plant in the water works pumping station. Ed. Hooper, city clerk.

Lakewood Hamlet, O.—Sealed bids are asked until Aug. 10 for building an addition to the electric light plant and installing an engine, boiler and two arc light machines. John French, clerk board trustees.

Kearney, N. J.—The contract for street lighting was awarded July 10 to the People's Light and Power company at $100 a year per light for sixty arc lights and $16 a year for 200 32 candle power incandescent lights.

Glendale, O.—Sealed bids are asked until Aug. 6 for the privilege and franchise for laying, maintaining and operating pipes and mains for supplying gas for illuminating purposes. Patrick Phelan, cy clk.

Electric light systems are contemplated at the following places: Cambridge, O., Saybrook, Ill., New Wilmington, Pa., Alliance, O., Mansfield, O., Dayton, Ia., Forreston, Ill., Heyworth, Ill., Hespeler, Ont.

TOO LATE FOR CLASSIFICATION

Wilkesbarre, Pa.—Brick paving is proposed for Scott-st.

Fergus Falls, Minn.—Plans for a new sewer are being prepared.

Saginaw, Mich.—Bids will be received until Aug. 3 for furnishing iron water pipe, hydrants, valves and special castings for

the ensuing year. Alfred Davies, clk. B. P. W.

St. Paul, Minn.—Asphalt paving is recommended for Mackubin-st.

Iowa City, Ia.—The residents on College-st. desire asphalt paving.

Zanesville, O.—A filtration system for the Muskingum river water is contemplated.

Oregon City, Ore.—An ordinance has been passed for a sewerage system on the hill.

Cincinnati, O.—An ordinance was approved, July 24, for asphalt paving on Eastern-ave.

Celina, O.—The city engineer has been authorized to survey this town for a sewerage system.

Alliance, O.—The estimated cost of paving Beck-ave. with brick is $7,788. Cy. Engr. Payne.

Bloomfield, Neb.—Sealed bids are asked until Aug. 11 for constructing water works. W. D. Funk, cy. clk.

Union City, Pa.—Bids are asked until Aug. 6 for 800-ft. of tile sewer in Crooked-st. F. L. Camp, cy. surv.

St. Paul, Minn.—Bids are asked until Aug. 2 for sewers in three streets. G. H. Bronson, clk. B. P. W.

Lima, O.—Bids are asked until Aug. 9 for 1,500 sq. yds. of brick or block paving. C. E. Lynch, cy. clk.

Washington, D. C.—The bids received July 7 for two gate houses at Brightwood reservoir were rejected.

Madisonville, O.—A proposition submitted by a syndicate to construct a sewerage system is being considered.

Gowrie, Ia.—Bids are asked until Aug. 6 (extension of time) for building water works. O. F. Blomgren, cy. clk.

Columbus, Ind.—Sealed bids are asked until Aug. 6 for 9,000 feet, 6 to 24-in. pipe sewer. Jos. Cochrane, cy. clk.

Amsterdam, N. Y.—Chas. G. Memenger was awarded the contract, July 19, for sewer construction, for $10,736.50.

Barrie, Ont.—Bids are asked until Aug. 8 for furnishing about 12,000 lin. ft. of cast iron pipe. E. Donnell, town clk.

Pontiac, Mich.—Lennane Bros. of Detroit secured the contract for 7,446 sq. yds. of paving, with curbing, sewers, etc., for $18,597.

Buffalo, N. Y.—Bids are asked until Aug. 6 for the improvement of White's Corners Road No. 2. Edw. A. Bond, state engr. and surv.

Washington, D. C.—Bids are asked until Aug. 4 for building sewers in the District of Columbia. H. B. F. McFarland, chrmn. dist. comrs.

Connellsville, Pa.—Bids are asked until Aug. 6 for 2,161 ft. of -0-in., 250 ft. 12-in. and 2,121 ft. 6-in. laterals. M. Marietta, chrmn. st. com.

Shelby, O.—The contract for asphalt paving on 5-in. concrete base was awarded to the Ayres Asphalt Paving company of Zanesville for $45,393 5-yr. guarantee.

Vincennes, Ind.—Sealed bids will be received until Aug. 13 for building about 20 mls. of gravel road in Busseron twp. Jas. T. Williams, co. audt.

Crawfordsville, Ind.—J. W. Waugh & Co. of this city was awarded the contract, July 20, for 19,500 ft. of 6 to 18-in. pipe sewer, 75 manholes and 3 flush tanks, for $13,282.

Dunkirk, N. Y.—Sealed bids are asked until Aug. 10 for 1,064 sq. yds. of paving or macadamizing, 1,031 lin. ft. curbing and 1,028 lin. ft. drain tile. W. G. Baumgarten, cy. clk.

East Newark, N. J.—Sealed bids are asked until Aug. 8 for 6,210 sq. yds. of asphalt paving on concrete base, 3,030 lin. ft. old curb reset, 350 lin. ft. new curb. Edw. Kenny, mayor.

Wells, Minn.—Sealed bids are asked until Aug. 7 for 1,520 ft. 24-in. sewer pipe, 26 6-in. single T's, 270 ft. 18-in. pipe, with 24 6-in. T's, and 8 brick manholes. H. W. Busche, vil. rec.

Dayton, O.—Sealed bids are asked until Aug. 20 for 25,705 lin. ft. 8 to 18-in. pipe sewers, 70 manholes, 30 flush tanks and 33 manholes in sewer dist. No. 4. Robt. H. Ferguson, cy. compt.

Springfield, O.—Bids are asked until Aug. 14 for paving E. Main-st. with brick. Resolutions have been adopted for brick or block paving on Locust-st., and brick on Lagonda-st. R. W. Lantz, cy. clk.

Philadelphia, Pa.—Sewer contracts have been awarded as follows: Daniel Dooley, 2 sts., $4,500 each; Richard Walsh, Wisanoming, Pa., 2 sts., $20,000 and $10,000 respectively; Chas. D. Land, 1 st., $28,000; B. J. Sullivan, Cohocksink, sewer, $98,800.

New York City—Bids are asked until Aug. 8 for alteration and improvements to receiving basins in several streets, Borough of Manhattan; Tremont and Arthur-aves., Borough of Bronx; reconstructing sewers in Fushing-ave., Borough of Queens. Jos. Kane, comr. of sewers.

Cleveland, O.—Bids are asked until Aug. 23 for furnishing and erecting two or four 25,000,000-gal. vertical triple-expansion crank and fly-wheel pumping engines to be erected at the Kirtland-st. pumping station. Bids are asked until Aug. 11 for furnishing and delivering 336 water meters. Walter P. Rice, dir. pub. wks.

Brooklyn, N. Y.—Bids were received July 26 for asphalt paving on concrete, as follows: Willoughby-ave.—Brooklyn Alcatraz Asphalt company, $2.50; Cranford company, $2.43; Eastern Bermudez Asphalt Paving company, $2.37. Carroll-st.—Brooklyn Alcatraz Asphalt company, $2.35; Cranford & Co., $2.45; Eastern Bermudez Asphalt Paving company, $2.45. Second-ave.—Brooklyn Alcatraz Paving company, $2.05; Cranford & Co., $2; Eastern Bermudez Asphalt Paving company, $2.15.

Newark, N. J.—Bids were received July 26 for asphalt paving in eight streets under the new form of specifications. The lowest bid was submitted was that of the Barber Asphalt Paving company, $2.12 a sq. yd., which is the highest ever asked in this city. The other bids were: Metropolitan Asphalt Paving company, New York City, $2.18; John F. Shanley, $2.14. The bids were laid over for a week for consideration. The principal difference in the new and old forms of specifications is the reduction of the amount allowed to contractors for keeping the asphalt in repair for five years after the original guarantee of 5 years has expired. Formerly the companies received 5 cents a year or 25 cents for the full term for keeping each square yard of asphalt in good repair. This has been cut down to 2½ cents per year or 12½ cents for five years.